

Rock Products

TRADEPRESS PUBLISHING CORPORATION
542 SOUTH DEARBORN STREET
CHICAGO

NATHAN C. ROCKWOOD, Editor

CHAS. H. FULLER, Manager

C. F. TREFZ, Associate Editor

Vol. XXIII, No. 9

April 24, 1920

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PUBLISHED
EVERY OTHER
SATURDAY
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ALPHABETICAL LIST OF ADVERTISERS

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Acton Pulverizer Co.	74	Gifford-Wood Co.	68	Osgood Co., The	63
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PLYMOUTH

Gasoline Locomotives

Take the Burden of the Haul

The first big cost that confronts is the transportation of materials—whether in the rough or finished product.

Coal and ore must go from vein to shaft.

Big timber from stump to mill.

Bulky cane from field to rolls and refinery.

Loosened earth from excavation to fills or dumps.

Road materials must follow workmen along the stretch of completed highway.

Mud and refuse must go from dredge to discard.

Stone from quarry to point of shipment.

Clay and marl from pit to pulverizer.

Bulky materials in the work must be taken from plant to plant.

No Matter What The Problem

No matter what the enterprise or industry, if haulage is a problem, then the Plymouth is the solution.

The Plymouth Gasoline Locomotive is the pioneer in industrial haulage. It has been the color-bearer for a score of years. It is the pace-maker with more speed, more power and more years of service.

Have you a haulage problem? Do you want to do more work for less cost and more profit? Do you want a way out of the lack of men and teams?

Then adopt the Plymouth way. Let the Plymouth take the grief and burden. Investigate now.

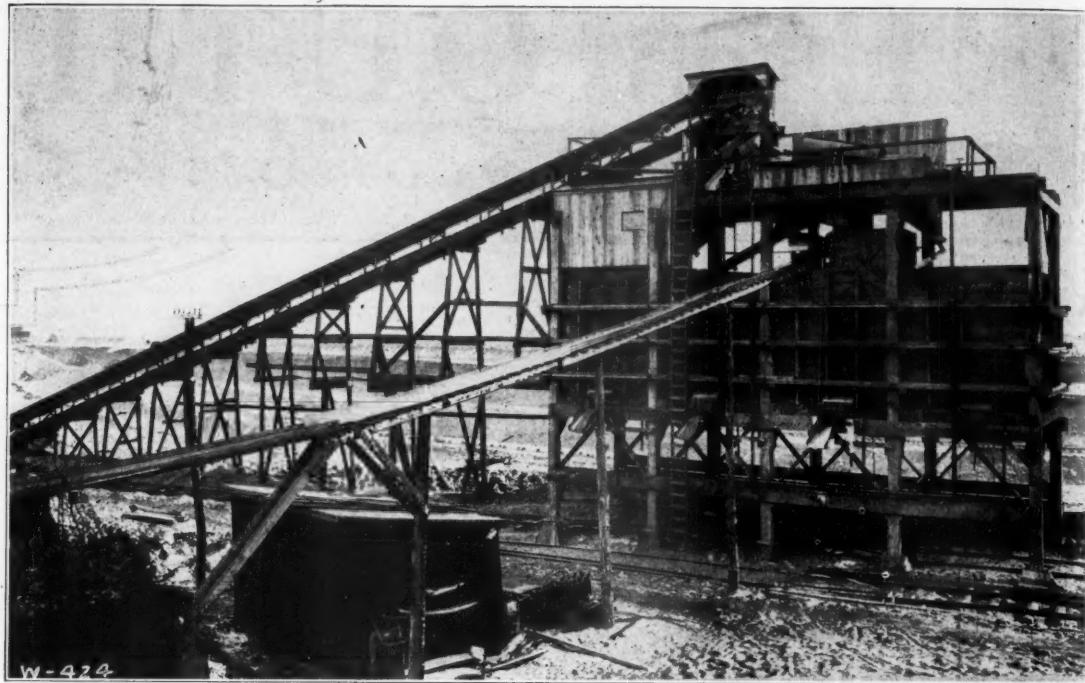
Our Engineers are at your service. Our bulletins are full of industrial information and haulage solutions. Write for them.

The FATE-ROOT HEATH Co.

210 RIGGS AVE.

PLYMOUTH, OHIO





WEBSTER

Sand and Gravel Plant Machinery

The Sand and Gravel Plant Equipment built by this company is more appreciated by the operator five or ten years after its installation than it is at the outset.

As the years go by he comes to know that Webster Equipment is not only well designed, but is unusually well built—exceptionally staunch and long wearing.

Today, after over forty years of honest manufacture, this company is coming into the fruits of its sound policy of making each item of equipment as good as it knows how.

Today, the Webster factory is crowded with orders considerably beyond its liberal production capacity.

Operators interested in the type of machinery that is responsible for this excess demand, will be serving their own interests by starting negotiations well in advance of their anticipated needs.

THE WEBSTER M'F'G COMPANY
TIFFIN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

When writing advertisers please mention ROCK PRODUCTS

(307)



Copyright 1920, by The Goodyear Tire & Rubber Co.

On the Machine Guns of Industry

Mining and quarrying subject air hose to tests that reveal the special strength and efficiency of Goodyear Monterey Air Drill Hose.

Dragged about over sharp, uneven, rocky surfaces and across mine timbering—every now and then smothered under falling stone or timbers—Goodyear Monterey Hose stands up ruggedly to the everyday hardships of the job.

Meanwhile, it holds the full pressure exerted from within and backs up the drill with the whole force of the air. The oil that works its way into the line is resisted by the specially compounded Goodyear Tube.

The kinks that develop cracks and bursts are prevented.

From every standpoint of air drill work, Goodyear Monterey Hose serves with the steady efficiency of a tool part.

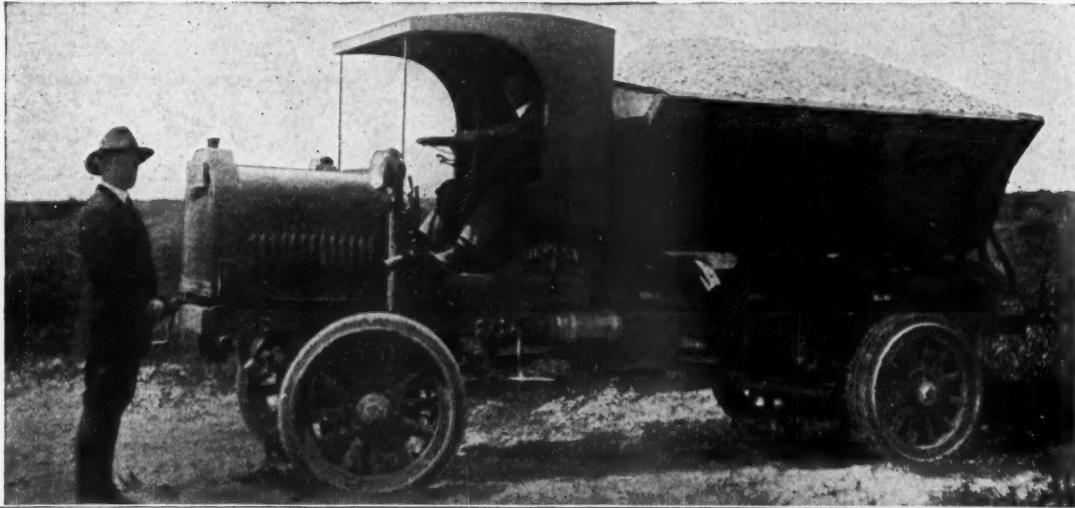
Besides being trouble-free, Goodyear Monterey Air Drill Hose is notable for its long life. It outlasts the usual hose offered for this unusual service by a long term of economical, capable use.

The working efficiency of Goodyear Monterey Air Drill Hose is the product of exact designing to the duty required of it and of the steadfast construction ideal expressed in the Goodyear maxim, "Protect our good name."

GOOD  **YEAR**
AIR HOSE

DUPLEX TRUCKS

BUILT FOR BUSINESS



The Duplex Limited

High Speed—Pneumatic Tired—Medium Capacity—Full Electrical Equipment
—Here is a Truck That Does Its Work Economically

ONE of the significant developments of these times in the truck industry is the increasing tendency for men to BUY their trucks—and to let fewer and fewer be sold to them.

Look at the success of the Duplex Limited. Already it is an established success—with a steadily growing demand coming from all sections and from men in all lines of business.

If you contemplate buying a truck of medium capacity, look over the Duplex Limited. Have your local Duplex dealer show you the Limited. Note its wonderful ruggedness and mechanical superiority.

It is a Duplex through and through—and as such a very safe investment for all general hauling.



DUPLEX
FOR BUSINESS

THE facts in the foregoing letter are typical of Duplex users wherever heavy dead loads are hauled under adverse conditions. The more difficult the conditions, the better Duplex quality and ability shows to advantage.

It explains why the Duplex is known everywhere as one of the oldest and most successful trucks in America.

As long as any wheel of a Duplex finds traction it will haul. And where every wheel has

contact, it will haul more economically, because every wheel, both front and rear, pulls all the way, and exerts double the leverage.

Gentlemen:
We have used a Duplex truck for two years and find it will do everything that the Company claims it will and a great deal more. We are hauling heavy loads over roads every load, over heavy gumbo roads that are impassable for a two-wheel drive truck. When it is wet you cannot see the spokes in the wheels and teams can hardly get through, but we use the Duplex all the time.

In regard to comparing it with horses, we could not do our work with horses for double what we can with the truck. We still keep horses but never use them for hauling; they are too slow and too expensive. Our hauling, mostly sand and gravel and our town is rather hilly, so one cannot pull a load with a team up our grades without four head, but our Duplex climbs all the hills with ease. We are going to order another Duplex as soon as we start our spring work.

Our repairs have been small, not quite \$20 for two years, outside of springs. We have bought two new springs—one rear and one front, but we are overloading our truck about 10% per cent all the time. We make trips into the country now that we could not make with horses, and all our country trips are made in the evening after a day's work in town.

Respectfully yours,

(Signed) D. L. Marshall & Sons.

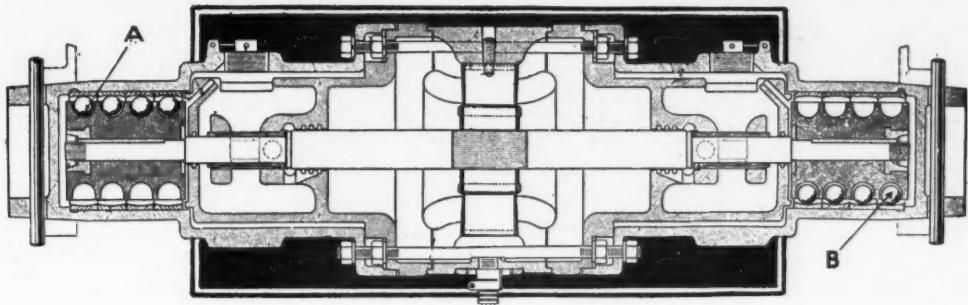
The facts about Duplex hauling are interesting and profitable to every business man who considers motor trucks not merely from the viewpoint of expense but also as a better investment.

Duplex Truck Company
Lansing • Michigan

One of the Oldest and Most Successful Truck Companies in America

When writing advertisers please mention ROCK PRODUCTS

The Vibrating Principle of the MITCHELL ELECTRIC VIBRATING SCREEN



U. S. AND FOREIGN PATENTS APPLIED FOR

A MECHANICAL principle by which the meshes of a screen can be forced up into the material 3,600 times a minute with an impact of 500 to 1000 pounds, and yet with absolutely no straining or jarring of the mechanism.

Is a principle of decided interest and importance to every concern operating screens, for it has completely revolutionized screening.

The illustration above is a sketch of the vibrator unit in a Mitchell Electric Vibrating Screen. The outer casing of the mechanism is of tubular form. The large cross-section at the center is the driving motor, through which runs a shaft. At each end of the shaft is keyed a hard fibre cylindrical ball cage, having radial bored holes to contain steel balls (A and B). Encircling the fibre ball cages and pressed tightly into the outer tubular casing are hard steel ball races.

Note in the illustration that the balls in one cage (A) are on top, while the balls in the other cage (B) are on the bottom. In other words, they are 180 degrees apart and are always kept so in operation. Now imagine the shaft rotating. You readily see that centrifugal force throws the balls against the ball races, resulting in an eccentric motion at each end of the shaft. To illustrate that motion, hold a pencil tightly at the middle between the thumb and forefinger of one hand and with the other hand move one end of the pencil in a slightly circular path.

This motion is transmitted to the screen cloth by means of steel arms or plates. The effect is to force the meshes into the material, keeping each mesh following an upward, circular path.

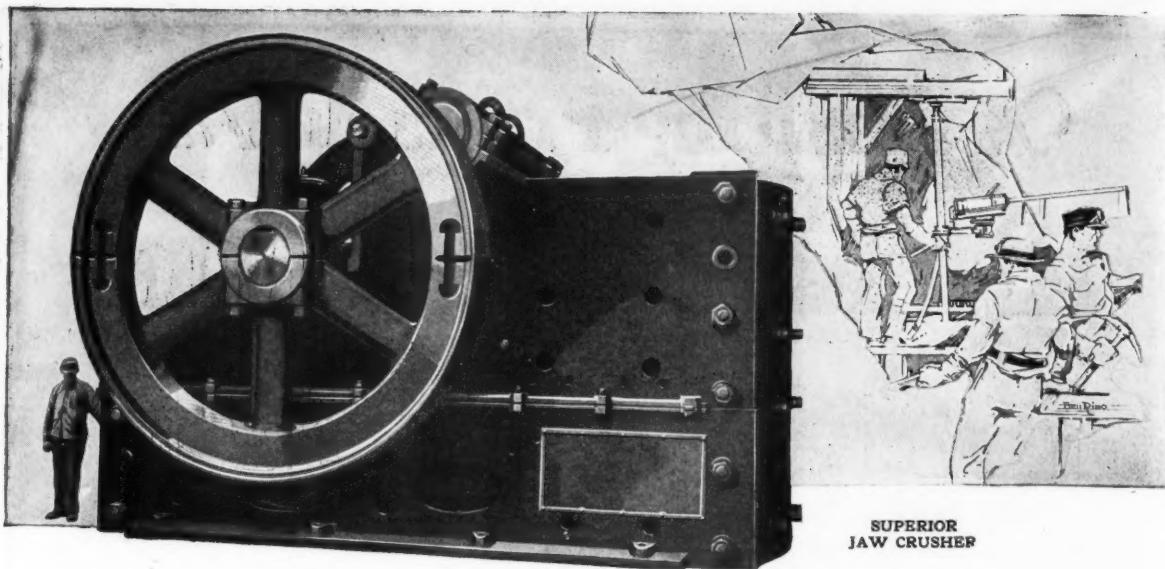
This mechanical principle explains why the Mitchell in 31 rigid tests showed an efficiency of 95 per cent, handling greater tonnage with less current than any other make of screen.

We welcome the most thorough inquiry as to Mitchell construction and performance in the classification of coal, ore, sand, gravel, slag, salt, sugar or any crystalline or granular material.

Stimpson Equipment Co.

315 Felt Building

Salt Lake City, Utah

SUPERIOR
JAW CRUSHER

— and 'neath the Midnight Sun Worthington Crushing Machinery

TO successfully meet the demand for a crusher capable of receiving and crushing rocks of any size that can be handled by steam shovels, Worthington designed and built their Superior Jaw Crusher.

Worthington pioneered in large Jaw and Gyratory Crusher construction and today, even in farthest-north Europe, Worthington Superior Jaw Crusher is handling iron ore with gratifying success.

Worthington builds Superior Jaw Crushers of very special materials, with all parts made very heavy to attain utmost strength, and in sizes from 36 x 24 to 84 x 66.

Worthington also maintains an engineering service which is freely tendered and without obligation. No matter how difficult your problem of installation may be, Worthington can solve it.

Worthington Pump and Machinery Corporation

*Executive Offices: 115 Broadway, New York City
Branch Offices in 24 Large Cities*

Other Worthington Products

Gyratory Crushers, Jaw Crushers, Air Compressors, Mine Pumps, Revolving Stone Screens, Ball and Tube Mills.

PUMPS—COMPRESSORS—CONDENSERS—OIL & GAS ENGINES—METERS—MINING—ROCK CRUSHING & CEMENT MACHINERY

WORTHINGTON

Deane Works, Holyoke, Mass.
Blake & Knowles Works
East Cambridge, Mass.
Worthington Works
Harrison, N. J.

Epping-Carpenter, Pittsburgh, Pa.

Laidlaw Works, Cincinnati, Ohio. Gas Engine Works, Cudahy, Wis.
Power & Mining Works
Cudahy, Wis.
Snow-Holy Works
Buffalo, N. Y.



When writing advertisers please mention ROCK PRODUCTS

Pulverizing Barytes

For the Paint and Rubber Trade

TEST				Final Preliminary	Methods Used		WEIGHED MATERIAL	
Duration of Test SEVEN HOURS								
Material Fed	Size 3/4"	Temperature COLD	Moisture DRY		Fineness	10 Mesh	%	
Remarks:	FEED VERY SATISFACTORY				Mesh	%		
					Mesh	%		
					100 Mesh	%		
					200 Mesh	%		
Capacity per hour	3000 #			Power Fan	20 H.P. 15 H.P.	Fineness	10 Mesh	%
Remarks:					Mesh	%		
					Mesh	%		
					100 Mesh	%		
					200 Mesh	TRACE	%	
					Mesh	%		
Changes to be made SUGGESTED STILL LOWER MILL SPEED TO REDUCE VIBRATION TO A MINIMUM								
This test supersedes TEST OF OCT. 30-1919								
This test followed by								
Signed W. B. SENSEMAN								

The accompanying test illustrates what a Raymond Two Roller Mill is doing in the **dry** grinding of Barytes, producing a product which equals the water floated variety.

Notice particularly length of test, capacity, power used and the fineness.

A trace on a 200 mesh test sieve means that only a few particles remained on the screen and they amounted to so little that they could not be weighed accurately.

The grinding of Barytes is only one of the many fine grinding problems handled by the Raymond System.

Your requirements of fineness can be met by a Raymond Mill with air-separation, and we will be glad to give full particulars if you will submit details.

Raymond Bros. Impact Pulverizer Company

Western Office:
201 Boston Bldg., Denver, Colo.

1301 North Branch Street, Chicago, Ill.



Blasting Accessories

Like Du Pont Explosives

Standard—Since 1802

FOR one hundred and eighteen years we have constantly carried on experiments and research work seeking to improve Blasting Practice in the mine, in the quarry, in road-making, in construction work, and on the farm. The development of Du Pont Blasting Accessories has progressed hand-in-hand with that of Du Pont Explosives, each the necessary complement of the other, until today they are recognized as standards the world over.

For better, safer and more economical use of explosives, be sure the Du Pont Oval is on *all* your equipment.

Blasting Caps
Electric Blasting Caps
Delay Electric Blasting Caps
Fuse
Blasting Machines
Electric Igniters, Delay

Galvanometers
Rheostats
Leading Wires
Cap Crimpers
Tamping Bags
Thawing Kettles

Write for our booklet, "Blasting Accessories." Just off the press.

E. I. du Pont de Nemours & Company, Inc.

Sales Dept.: Explosives Division

WILMINGTON, DEL.





***Men to Do This Work Are Hard to Get
and Hard to Keep***

Demand anywhere from \$4.00 to \$6.00 daily (each). Tire easily—delay loading of your trucks—lessen output and profits.

Jeffrey Type "K" Radial Loader

Does away with 5 to 10 men. Loads the largest truck in 8 to 10 minutes. Is built to stand the heavy work of handling crushed stone, sand, gravel, coal, etc.

Wouldn't it pay you to write for Catalog No. 288-N, fully describing this loader? There's a copy waiting for you.

The Jeffrey Mfg. Co.
935 N. Fourth Street, Columbus, Ohio

New York
Boston
Cleveland
Philadelphia
Pittsburgh
Detroit

Branch Offices:
Chicago
St. Louis
Milwaukee
Denver
Birmingham

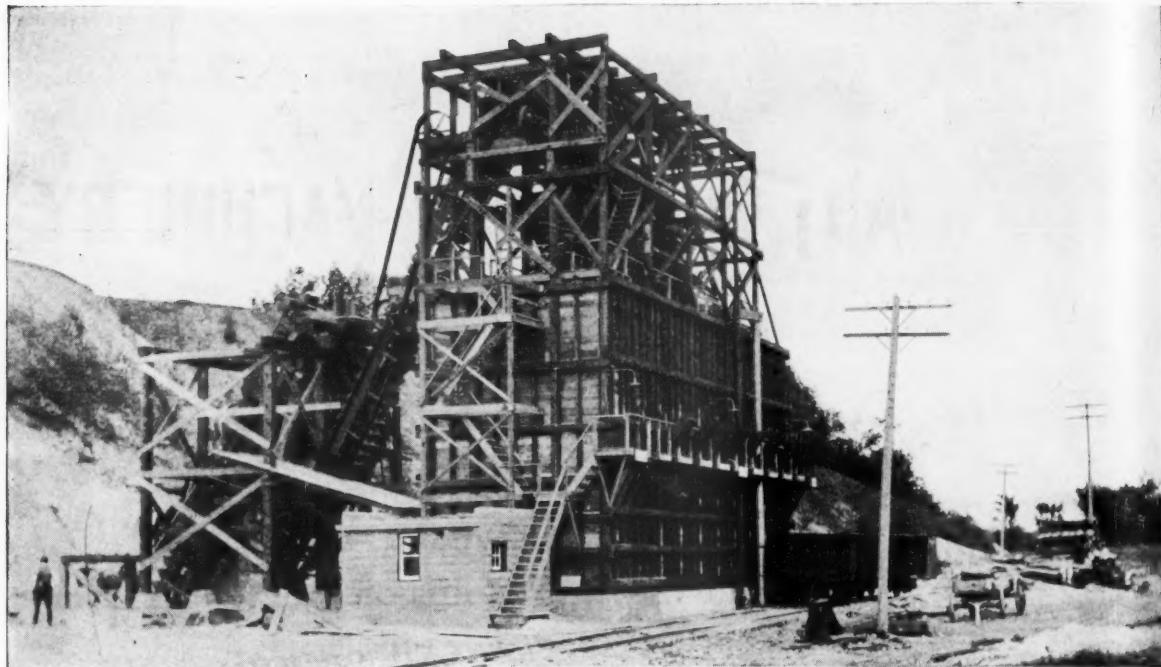
Dallas
Seattle
Montreal
Scranton
Los Angeles
Charleston, W. Va.

Long flexible spout enables operator to properly distribute load without shoveling.



The Radial Loader feeds itself into pile 8 to 10 feet—no hand shoveling or mechanical devices needed to bring material to buckets.

One Man Control



Plant of the Elkhart Sand and Gravel Co., Elkhart Lake, Wis., capacity 1600 tons per day of 10 hours

Complete gravel crushing, screening and washing outfits

Branch Offices

Boston, Mass.
New York, N. Y.
Philadelphia, Pa.
Pittsburgh, Pa.
Atlanta, Ga.
Knoxville, Tenn.
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Portland, Ore.
Kansas City, Mo.
Fort Wayne, Ind.
Muskeg, Okla.
Denver, Colo.
Billings, Mont.
Boise, Idaho
San Francisco, Cal.
Los Angeles, Cal.

We plan and build complete gravel crushing, screening and washing outfits for every purpose.

The successful operation of such plants is guaranteed because the machinery installed is designed and manufactured entirely in our own factories.

Screens are of the non-clog type. All the sand or gravel is thoroughly washed, evenly sized and delivered exactly as desired. Write for catalog containing full particulars of excavating, elevating, conveying, crushing, screening and washing equipment.

General Sales Offices

832 Bulletin Building

Philadelphia, Pa.

The **GOOD ROADS**
Machinery Co., Inc.

When writing advertisers please mention ROCK PRODUCTS



Where speed is not the main essential, "American" Hand Power Derricks do the work—at a saving

Handling finished stone slabs weighing many tons is all in the day's work for the Harrison Granite Company.

The placing of these huge slabs requires extreme accuracy and care—a dropped or broken slab means big expense and long delay.

The outfit illustrated above consists of an "American" 13-inch guy derrick and No. 14 crab. It is used to erect monuments and mausoleums and very often is called upon to make some very heavy lifts. It has been doing this kind of work for a number of years and has been shipped about from job to job.

Wherever you are, an American representative can reach you in twenty-four hours.

American Hoist & Derrick Co.
55 South Robert St.
Saint Paul Minnesota

Builders of "AMERICAN"

Hoisting Engines
Electric Hoists

Derricks
Locomotive Cranes

Railroad Ditchers
Logging Equipment

Sugar Cane Machinery
Marine Deck Machinery and Tackle

The Genuine "Crosby"
Wire Rope Clip

Branches: New York

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AMERICAN HOIST & DERRICK CO.

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MISSING

They Also Operate Telsmith Crushers

If you still doubt that the Telsmith Primary Breaker stands twenty per cent ahead of all other crushers in strength, output and general serviceability, you can clear up all questions by referring to the man who knows Telsmith at his best—the USER. We submit the names of just a few more responsible people who can give you first-hand Telsmith data that none will question:

Stringtown Crushed Stone Co., McAlester, Okla.
Rosiclare Lead & F. S. Mines, Rosiclare, Ill.
Siems, Heimers & Schaffner, St. Paul, Minn.
Charles Warner Co., Wilmington, Del.
St. Joseph Lead Co., Bonne Terre, Mo.
Hilder Granite Co., St. Cloud, Minn.
E. J. Laving & Co., Philadelphia, Pa.
Shattuck-Arizona Copper Co., Bisbee, Ariz.
Phelps-Dodge Corp., Tyrone, N. Mex.
Loretto Iron Co., Loretto, Mich.
Globe Graphite & Refining Co., Port Elgin, Ont.
Kentucky River Stone & Sand Co., Lawrenceburg, Ky.
Caspari Stone Co., Piqua, Ohio.
Upson Nut Co., Cleveland, Ohio.
Phoenix Iron Co., Phoenixville, Pa.
Standard Chemical Co., Canonsburg, Pa.
White Marble Lime Co., Manistique, Mich.
Kenecott Copper Corp., Latouche, Alaska.
St. Joseph Lead Co., Bonne Terre, Mo.
Waukesha Washed Sand & Gravel Co., Milwaukee, Wis.
Barnes-King Development Co., Marysville, Mont.
Tech Hughes Gold Mines, Ltd., Cobalt, Ont.
Crystal Lake Crushed Stone Co., Sheboygan, Wis.

Telsmith has a 20% advantage in strength, capacity and general serviceability. Our customers will back up the claim. Don't you owe it to yourself to make inquiry? Glad to mail you our catalog No. 166 (Telsmith Primary Breakers) and Bulletin No. 2-F-11 (Telsmith Reduction Crushers).

SMITH ENGINEERING WORKS
3188 Locust Street
Milwaukee, Wis.



Old Colony Bldg. Chicago, Ill.	110 W. Park Way, N. S. Pittsburgh, Pa.
30 Church St. New York City	Franklin and Channing Aves., St. Louis, Mo.
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325 W. Main St. Louisville, Ky.	Road Builders Equip. Co. Portland, Ore.
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Kelly-Powell, Ltd. Winnipeg, Man.	

(R-151)



Make Every Shot COUNT!

WITH PRODUCTION COSTS mounting higher and higher, it is more essential than ever that you make every dollar's worth of explosives do a dollar's worth of work.

All doubt in this direction is set at rest when you use Aetna Explosives. They are manufactured from special formulas designed to give maximum disruptive power. Properly placed and fired, Aetna Explosives bring down the rock in profitable quantity—and shattered to the desired size.

Aetna Explosives, moreover, being uniform in quality, can always be depended upon to give the same results.

Aetna Explosives are most effective when used with Aetna Blasting Supplies.

Write for full particulars

AETNA EXPLOSIVES COMPANY, Incorporated
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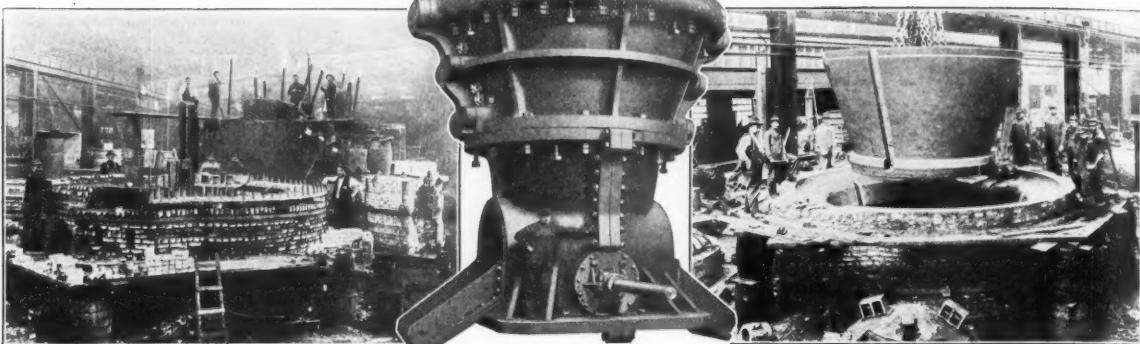
It does the work!



BUILDING TWO GREAT CRUSHERS

With 54-inch

Openings



Constructing the Loam Mould for the Top Shell
of the No. 27 Double Discharge Gates Gyratory
Crusher

Lowering the Central Core of the Top Shell into
the mould of the No. 27 Double Discharge Gates
Gyratory Crusher

Announcement

Beginning with this issue there will appear a series of advertisements illustrating in successive steps the moulding, machining and assembling of the two

Largest Crushers Ever Built by This Company for One of the Largest Copper Mining Companies in the World

This is the first of a series of "Progress Photographs" taken during the construction of these crushers.

The successful operation of over 7,000 Gates Breakers of various sizes in all parts of the world, under every condition of operation, insures satisfactory service to every purchaser of Allis-Chalmers Gates Breakers.

This success is due to the "Self Contained Manufacturing Facilities" of Allis-Chalmers Manufacturing Co. in the building of special and very heavy machinery.

These "Self Contained Manufacturing Facilities" are illustrated in this series and will show how the largest of our crushers was built complete in our own shop, by mechanics who have been engaged in this class of work for many years, using our standard system of jigs, gauges and templates, under the supervision of highly skilled engineers and superintendents.

Not a single piece of these crushers was "sublet" to other manufacturers.

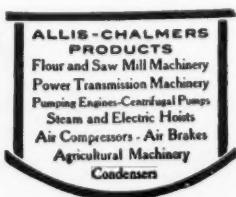
The crushers, therefore, have a complete manufacturing and engineering organization behind them with facilities to give any service which their use may require.

The next advertisement of this series will appear in the May 22nd issue, when we will tell you more about Allis-Chalmers facilities for doing large work.

Write for Bulletin No. 137C



ALLIS-CHALMERS
MANUFACTURING COMPANY
Milwaukee, Wisconsin, U. S. A.
District Offices in All Leading Cities

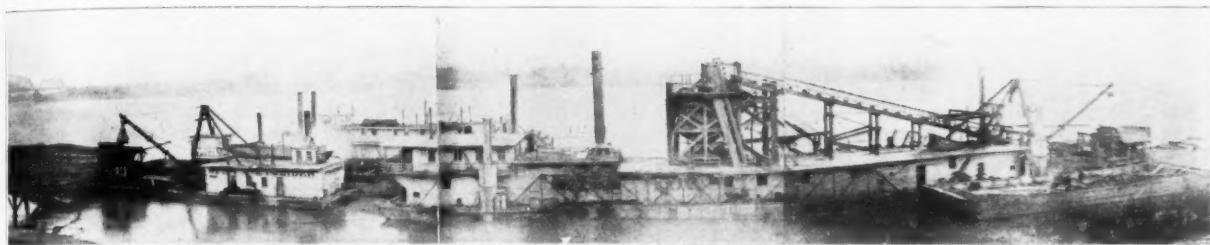


Rock Products

Vol. XXIII

Chicago, April 24, 1920

No. 9



The sand and gravel digger and river unloading equipment of the E. T. Slider Co.

Floating Screening, Washing and Crushing Plant

Ohio River Sand and Gravel Digger Operated by the E. T. Slider Company, Washes, Sizes and Crushes Material

ONE OF LOUISVILLE'S largest river sand and gravel operators, the E. T. Slider Co., has completely overhauled its big clam-shell sand and gravel digger during the present winter and has now had it operating on the river for several weeks. The unusual demand for gravel during the past winter and the large early spring shipments have made necessary very early river operation. This digger is different from most others in that the material is not only washed and screened aboard the boat, but a crusher is installed and the material over 2 in. and less than 5 in. is crushed.

This is the companies' fifth year of experience in operating a crusher on a floating structure, and very pleasing results have been obtained. Most diggers just reject the oversize material, but this company cites two reasons why it is expedient to crush the large boulders. First, when rejecting material back to the bed of the stream it is often rehandled. Of course rehandling of unsuitable material is a dead loss. Second, the large material is mostly granite boulders and makes an excellent crushed product, which others lose. Also, this increases the capacity of the digger. There being such a small per cent of material over 5 in., it is more profitable to reject it than

to drive a machine large enough to handle it.

Operation of Dredger

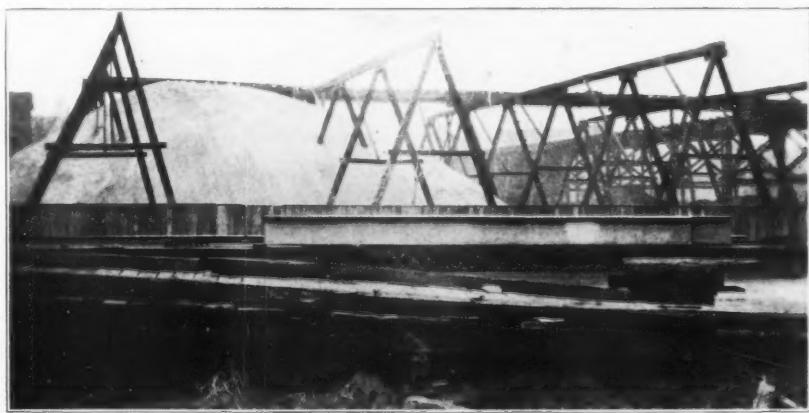
The digger is one of the largest on the Ohio River, being 40-ft. beam by 260 ft. long. It has living quarters which will accommodate an operating crew of nine men. These men make the boat their home during the entire operating season.

The sand and gravel is excavated sometimes to a depth of 60 ft. by a 3-cu. yd. clam-shell. The bucket deposits the material in a sheet-iron rejection chute

which has 5-in. circular perforations in it.

At a depth of 60 ft. the clamshell will make one dip per minute, that is it will put 3 cu. yd. of sand and gravel into the rejection hopper per minute.

The boulders above 5 in. are rejected to a barge and disposed of in deep water. The rest of the material is fed to a 36-in. conveyor belt, which is 125 ft. center to center. This conveyor elevates the material to the sizing screens. The sizing is done in a battery of Gilbert screens which are mounted one under the other. The 2-in. rejections are chuted to the



Storage yard for sand and gravel, showing the overhead trestle used to put the sand into the storage



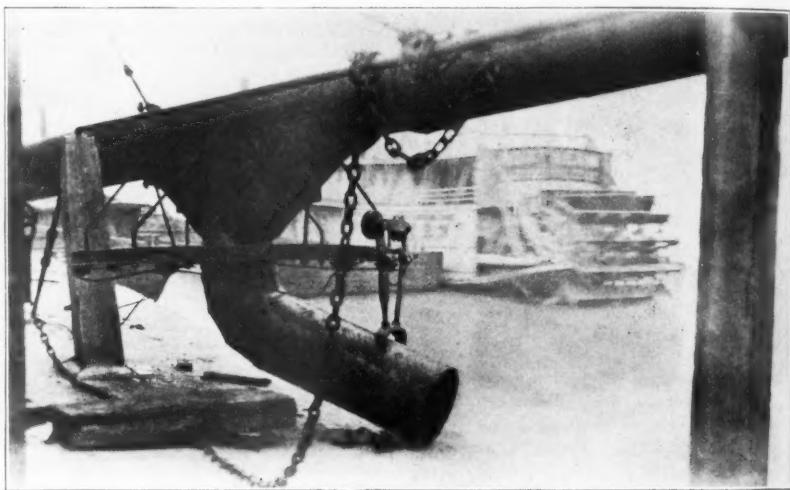
Elevating material from the water level to the cars or storage yard

crusher which is mounted in the hull of the boat. Ordinarily the crusher reduces everything between 5 in. and 2 in. However, at times the machine is set closer so that everything will be crushed to 1 in.

The screening surface is divided into two independently driven units of four screens each. The units each have two gravel screens and two sand screens. This enables the digger to operate at half capacity while one set of screens is being repaired. A pan is fastened under each screen so that the size stone may be collected and the whole screening system is boxed in by sheet-iron. The compactness and economic arrangement is apparent from the views.

Commercial Sizes

Three sizes of material may be made and loaded into barges at one time. The gravel and coarse sand are each collected from the screens and fed onto separate conveyor belts. These deliver the mate-

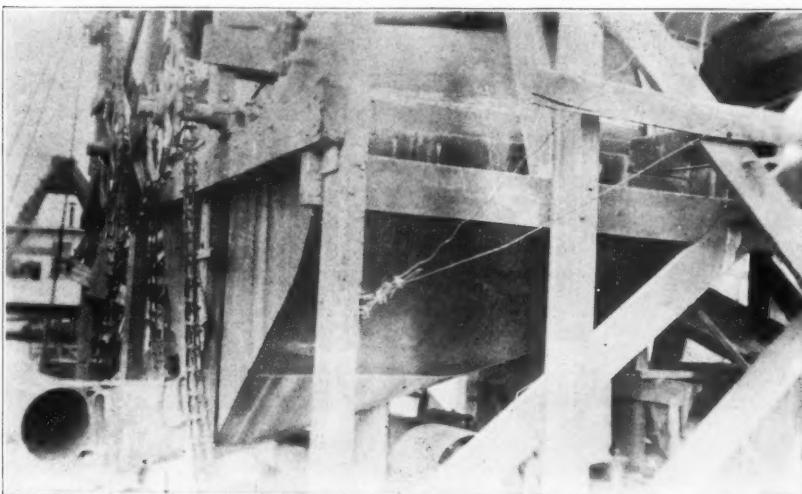


Discharge sand pipe takes place of settling box

rials to two barges on one side of the digger.

in 225-cu. yd. barges. The current floats these under a derrick mounted clam-shell on shore, which unloads them and puts the sand into a loading chute. The view gives a good idea of how the material is elevated from the water level.

E. T. Slider is president and general manager of this company, which has a daily capacity of 800 cu. yds. per ten-hour day.



Compact arrangement of the sizing screens

Wisconsin Contractors Want Uniform Discount

CONTRACTORS in person as well as the secretary of one of the contractors' associations of Wisconsin, have been desirous of the members of the Wisconsin Mineral Aggregate Association adopting a uniform discount for payment of bills before the expiration of a specified time. The general letter of the Wisconsin Mineral Aggregate Association states that this matter will be discussed at the April meeting.

Equity on Freight Rates for Mineral Aggregates

Appeal Made to the Interstate Commerce Commission by President of the National Crushed Stone Association for Investigation of Rates on Mineral Aggregates

JOHN RICE, President of the National Crushed Stone Association, has written a letter to the Interstate Commerce Commission in reference to equity in freight rates on mineral aggregates compared with freight rates on other commodities. This letter resulted from the earnest consideration of the freight rate question at the annual meeting of the National Crushed Stone Association in Louisville, Ky.

Crushing Stone a Basic Industry

In the first part of Mr. Rice's letter he explains why the crushed stone industry is one of the basic industries of the country. Crushed stone enters into almost every conceivable kind of construction which enlists the activities of mankind. The country's two million miles of rural highway will in the next 30 years require some six billion tons of stone; the railroads another billion; general construction still another and renewals and maintenance will require some fifteen billion tons more. In all, there will be a yearly demand of five hundred million tons.

In the last generation the investments in the crushed stone industry have increased from \$25,000 to \$50,000 per plant to \$150,000 to \$500,000 per plant and some plants have expended \$2,000,000 in the last five years.

All of this capital is expended to reduce the cost of producing stone. But one-half of the price paid for stone at the delivered point is freight rates.

This causes consideration of the basis of the present freight rate structure—"What the traffic will bear." Mr. Rice continues:

Revenue on Crushed Stone Proportionately Too High

"It is the earnest belief of this association that the present revenue derived from crushed stone is proportionately greater than from many other commodities, aside entirely from the fact of their greater ability to stand the heavier burden. Whether this belief is true, the fact is unquestionably susceptible of proof. It is not difficult for the shippers in the industry to establish the revenue earned on crushed stone, but it is a monumental task to make the comparison with other commodities. Such an investigation

seems a function and an obligation of your honorable body in the interest of justice to all shippers. In addition to the discriminatory condition believed to be true as aforesaid, your attention is respectfully directed to the following proposition.

"The cost of transportation is made up of two broad general elements, one which may be called the 'assignable' expense, which is that character of expense which can be reasonably and with some definiteness assigned to the cost of handling freight of various classifications with due regard to its peculiarities; the other which may be designated the 'overhead,' consisting of all other charges than aforesaid, covering interest on bonds, taxes, insurance, general administration expenses, and that proportion of actual operating expenses which are of a general nature.

"All traffic should bear, first, its 'assignable' expense, and the 'overhead' should be apportioned to various commodities in accordance with their ability to bear it. Such a theory is based upon the principle that the value of an article is at destination, and not at point of origin, and therefore the more costly commodity can with reasonable expectation bear the larger proportion of this overhead. This is merely applying to transportation the principle applicable to a bi-product in any industry. When a bi-product is first discovered or developed its cost is usually not loaded with its proportional share of the overhead of the related industry. Generally speaking, if it were, the price at which it would have to be sold would be prohibitive. But when it has risen from this incidental to the essential relationship to its industry it carries with it, its full proportionate share of overhead based on its value.

"The principle involved may also be illustrated in the experience of the return haul of empty cars. Let us, for the purpose of illustration, assume a movement of cars east from an old established coal mining center, with a western return of cars empty. The coal tonnage must bear the expense of this double-way movement. However, it occurs that in the course of time a new commodity springs up requiring a western movement. In order to encourage the move-

ment of this commodity the railroads have in the past very naturally and logically, made a rate to encourage this growth. It is a rate frequently only a trifle more than the "out-of-pocket" expense, because whatever it is, it produces some return in excess of outlay and is that much better than nothing. In time the new commodity gains strength and the burden of the overhead is gradually loaded upon it to the extent that it can bear without strangulation and therefore the two commodities do or should carry a rate proportioned to their ability to bear it, and to ultimate advantage to the railroad and the shippers of the respective commodities when proportioned with judgment.

"In the evolution of this principle, gross, though possibly unwitting, discriminations have occurred.

"It is believed that crushed stone is such a commodity as has been gradually loaded from a point of original encouragement to a point beyond its fair share. The decision of your Commission in the case of the Birdsboro Stone Co. vs. the Pennsylvania Railroad, as well as a number of other decisions, evidences the fact that in the judgment of your Commission rates on crushed stone were relatively too high.

"In view of these decisions it is hoped that the sympathetic consideration of the problem may be given by your Commission and should simply a modification of rates be contemplated it will give more general satisfaction to this industry if the differentials between competitors be preserved as far as possible and the rates on crushed stone in force prior to the war as compared to those of other commodities are deemed to be more equitable than the existing rates and changes made now should preferably be based upon pre-war relationship.

"However, and in conclusion, this Association seeks no selfish nor discriminatory advantage, but urges a scientific reconstruction of rates as contrasted to modification and an equitable apportionment to all commodities of the revenue deemed necessary for the successful operation of the railroads. The Association stands ready to assist in the furnishing of any data pertaining to its industry as the Commission may request."—John Rice.

Hints and Helps for the Plant Superintendent



View of the 100-ft. face just before the blast, taken from the end nearest the cement plant, showing the amount of ledge which was blasted and the layout of the face. The ledge is well stratified and clear of any seams which would make blasting difficult



The rock was considerably broken up by blast and leveled to a 40-ft. depth, as shown by this view, which was taken after the blast. Some of the stone was thrown out 100 ft. from the face, but no damage was done to trackage and equipment

Blast at the Dixie Portland Cement Co. Quarry

THE ACCOMPANYING illustrations and complete blast data of a shot in which 48,200 lbs. of ammunition was used and in which 236,247 tons of rock were shot down, were submitted to Rock PRODUCTS by General Superintendent W. H. Klein of the Dixie Portland Cement Co., Richards City, Tenn.

The survey of the quarry, computation of loads and compilation of data and results were made in the engineering department of the cement company. It is an established practice with the company to work up such data after every shot so that comparisons may be made of each shot.

The views show that the quarry is a hillside formation and the face shot down varied from 62 ft. 6 in. at the low end of the hill to 134 ft. 6 in. at the highest point. The holes were well drilled and the average depth was 103.97 ft. The frontage or burden of the shot varied from 26 ft. at the point where the face was highest to 46 ft. at the end of the hill where the face was lowest. The average frontage was 35 ft. Forty-one holes in one row were shot at one time. The spacing of the holes varied from 16 to 24 ft.

Each hole is numbered and the accompanying table shows the load of powder used in each hole and the cost of powder per hole. Three kinds of powder was used, 60 per cent gelatine, 60 per cent nitro-glycerin and 50 per cent nitro-glycerin. All holes were loaded with 60 per cent gelatine dynamite in the bottom and 60 and 50 per cent pulp dynamite in the top, where both were used.

As is shown in the sketch, ten snake holes were used in front of holes 1, 2, 3 and 4; these were spaced 20 ft. center to center and 450 lbs. of 1 1/4-in. gelatine powder was used in them. The function of these holes was to aid in breaking the shoulder where the shot ended.

The cost of powder for shooting was analyzed as follows:

Total pounds of ammunition.....	48,200
Total ammunition cost.....	\$11,463.00
Cubic feet of rock shot down.....	2,881,058
Weight of rock per cubic foot (pounds).....	164
Tons of rock shot down.....	236,247
Cost per ton.....	\$0.048
Tons of rock per pound of powder.....	4.9

The blast was set off by Cordeau and

exploders. Counter Cordeau was used in the holes, because the company has found that where the Cordeau must support its own weight the plain Cordeau is not strong enough. The only difference between plain and countered Cordeau is that the countered has a layer of cotton cord over the lead tube filled with T.N.T. The cotton cord gives additional strength. The Cordeau from each hole was connected to a trunk line of plain Cordeau which ran the entire length of the ledge to be shot.

The connections of these lines were made by splitting the ends of the Cordeau projecting from the holes and then laying the plain trunk line in the crotch thus formed and then wrapping the split ends about the trunk line.

Detonation of the main holes was produced through this trunk line by means of a No. 8 exploder at the end of the trunk line. The snake holes were detonated by exploders which were connected up in multiple with the exploder on the trunk line. These exploders were ignited by means of a blasting machine. A total of 8,179 ft. of countered Cordeau at a cost of \$408.95 and 1,100 ft. of plain Cordeau at a cost of \$46.75 was used.

A Dehydrating Elevator

IN ORDER to separate the phosphate sand and the water, after the phosphate has been washed, the Hoover Mason Phosphate Co., Mt. Pleasant, Tenn., has designed and made the dehydrating elevator illustrated here.

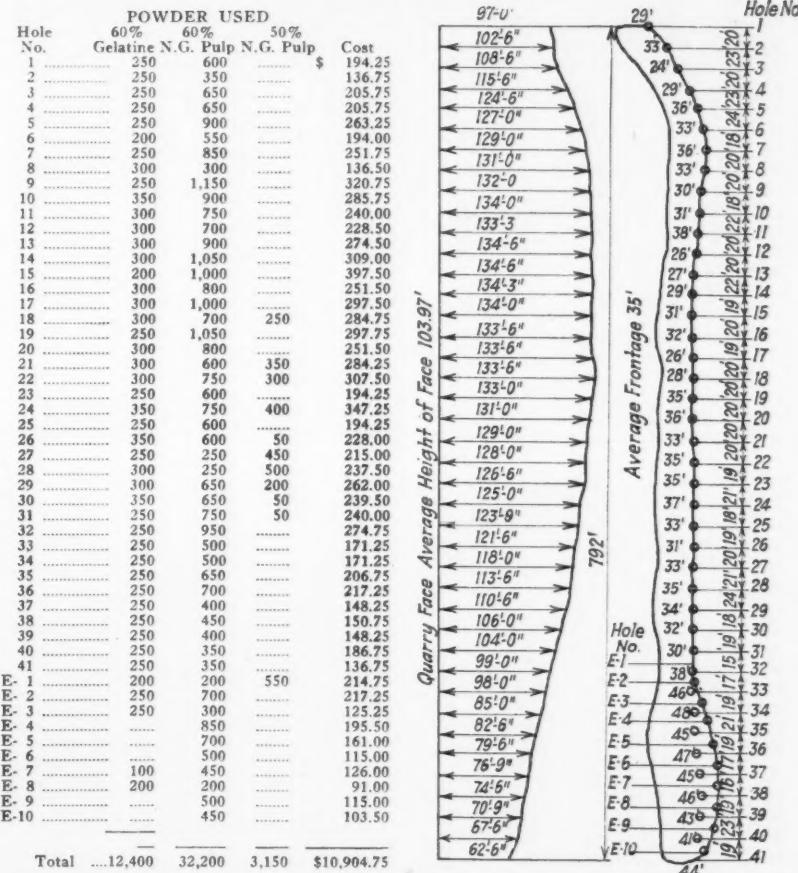
The elevator is of the chain bucket type but differs essentially from the ordinary



Dehydrating elevator



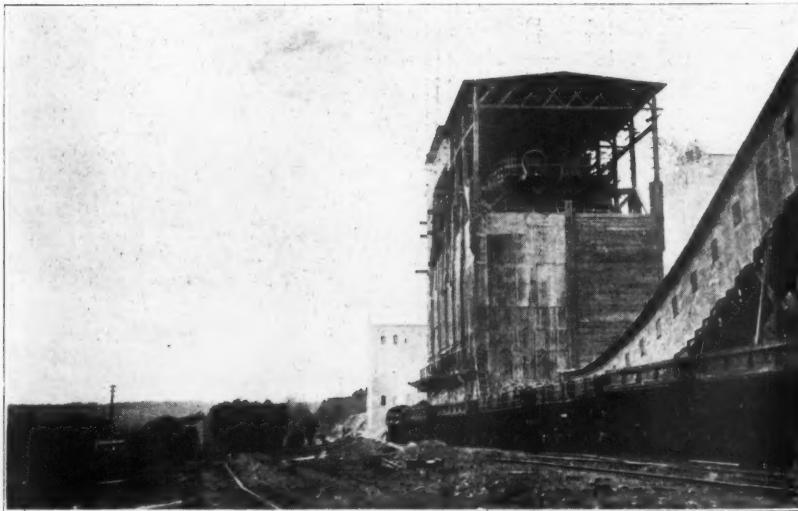
The blast from the distance



chain bucket elevators. The bucket proper is in reality no more than a shelf and is composed of two pieces. The bottom of the elevator dips into a settling box and the top discharges into a dry hopper.

As the buckets descend into the settling

box and round the bottom pulley the shelf opens and scrapes up some sand. On the trip to the hopper above all water is drained off and at the top a trip swings the shelf so that the sand is deposited into the dry box.



Top—Quarry and track to plant at left; Center—Crushing plant from quarry approach; Below—Screening and bin house, with lower end of crushing plant in background

Economical Side-Hill Trap-Rock Crushing Plant

WHAT IS REPUTED to be one of the most economically operated trap rock crushing plants in the country is that of the New Haven Trap Rock Co., at North Branford, Conn., about nine miles from New Haven. This plant was completed early in 1915 and has since been one of the "show" plants of the East.

The quarry is on a mountain back of the plant, and the present quarry floor level is at such an elevation that it could be worked by a gravity transportation system to the plant.

The trap rock is in a columnar formation which is broken up by large blasts with very great economy. A typical blast at this quarry was described in *Rock Products* of April 26, 1919. At that time 5,000 lbs. of 60 per cent dynamite reduced to crusher feed size, 60,000 tons of rock, or about 12 tons to a pound of powder. This, of course, is very economical quarrying as a starter.

Quarry stone is moved to the plant on a 2 per cent down grade in train loads of standard-gage side-dump cars. The size of the trains is only limited by the number of empties the 45-ton locomotive can haul back. Practically no traction effort is required to move the loaded trains.

Trains run through the center of the crusher building and the cars are dumped into a 48x72-in. jaw crusher (set to reduce to 10-in. size) which discharges through a short chute into a No. 10 gyratory, set to reduce to 5-in. size. The gyratory discharges to a short belt conveyor which rises at a very slight inclination.

This conveyor feeds a 60-in. by 15-ft. jacketed scalping screen which discharges its rejections to a 30-in. belt conveyor feeding a battery of four No. 6 gyratory crushers. The material passing the main barrel of the screen and rejected by the jacket screen passes to a belt conveyor beneath the battery of No. 6 crushers, which also contribute their discharge to the same conveyor. This conveyor feeds two secondary scalping screens 60-in. by 15-ft., side by side on parallel shafts. The feed to the screens is divided by a hopper with a partition in the center.

The fines passing the screen jacket go to another belt conveyor parallel to the one carrying the stone to secondary scalping screens, but bypassing these screens. This prevents the two secondary screens from handling any small sizes other than those produced by the battery of No. 6 crushers and also reduces the handling of the stone.

The secondary scalping screen rejections are discharged to two 48-in. disc crushers immediately below, the mater-

ial passing the screens, the product of the disc crushers and the dust from the main scalping screen all go to a 30-in. belt conveyor at right angles to the axis of the crushing house. By this conveyor the stone is elevated to the top of a screening or bin house where the stone is discharged first into two parallel 60-in. x15-ft. jacketed sizing screens which take out all the 2-in. and 1½-in. sizes and drop them into the first two bins below. The finer sizes go by a belt conveyor to another battery of two parallel screens 48-in. by 18-ft., which separate the 1-in. and ¾-in. stone.

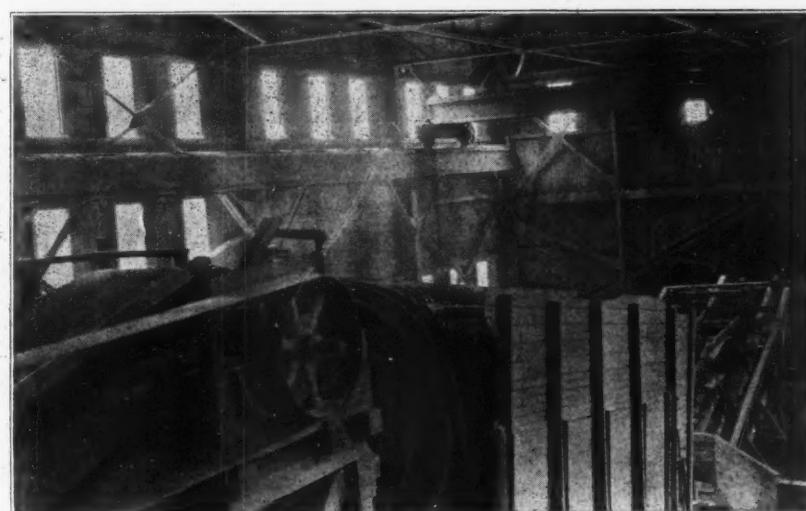
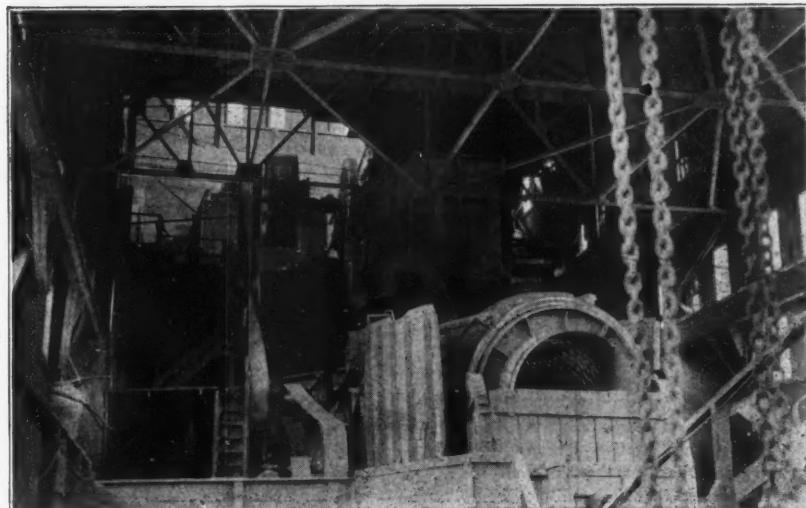
The jackets of these screens have ¾-in. holes for the first half of their length and ½-in. holes for the second half. All the stone passing through the ¾-in. holes falls on a pair of pulsating screens which clean and separate the ½-in. stone from the dust and dirt. The ½-in. holes in the screen jackets remove the ½-in. stone, and the tailings from the body of the screens give the 1-in. and the tailings from the jacket the ¾-in. sizes.

The plant is undoubtedly one of the most completely equipped stone-crushing plants in the country, and has never yet been operated to its capacity because thus far it has not been possible to bring the stone to it fast enough. It will be seen that it contains more machinery and equipment than is often considered necessary, but five years of operation have proved the economy of the layout, in which, it will be noted, the flow of the material is continuous, no piece of machinery being expected to serve more than one purpose.

The plant is electrically operated throughout. The jaw crusher and its conveyor and the large gyratory crusher and its conveyor have individual motors, while the battery of four No. 6 crushers is driven by a single motor. One motor also drives the two long conveyors and the secondary scalping screens, while the disc crushers are driven by another motor. This enables any one department of the plant to operate independent of all others.

The jaw crusher, No. 10 gyratory and battery of No. 6 crushers are set on concrete foundations in steps down the side of the mountain, so that with the exception of the conveyor from the secondary crusher to the first scalping screen and the short conveyor which feeds the re-crushers, the flow of the stone is entirely by gravity. The rise from the re-crushers' discharge to the secondary scalping screens is very slight, so that practically none of the stone is elevated until it is completely finished so far as crushing is concerned.

The plant was designed by Preston K. Yates, Consulting Crushing Plant Engineer, of New York; W. Scott Eames of New Haven, Conn., is General Manager.



Top—Primary and secondary crushers and main scalping screen; Center—Main scalping screen; Below—View from end of main scalping screen, showing secondary scalping screens below

Sand Plant Operator Mounts Pumps on Bank

The Macon Fuel and Supply Co. Operates Unusual Sand Plant—Will Build a Floating Dredge in the Near Future

CENTRAL AND SOUTHERN Georgia has an abundance of granite and limestone to furnish the coarse aggregate for building purposes, but the amount of sand for the fine material is quite limited. The Macon Fuel & Supply Co. at Macon, Ga., has developed an unusual sand producing plant on the Ocmulgee River.

This merely consists of two 6-in. sand pumps mounted on the bank with a railroad siding so that the sand may be pumped into the cars.

The fact that the pumps are mounted on the bank requires a special arrangement to enable pumping to any great extent. A 6-in. steel riveted hose is used for the pontoon line to the pump suction, which is controlled and located by a man on a small flat boat.

Movable Pump Suction

At the beginning of operations the pontoon was short and circular cuts were made; that is, the man on the barge swung the pump suction around from one point on the bank below the pump to a point above the pump, the length of pontoon being the radius and the pump the center of the circle. Then a section of pipe 18 ft. long was added to the pontoon and a second cut was made, and so on. Sand is pumped to a depth of 22 ft.

At times the pontoon line has been increased to as much as 300 ft., which is considered an unusually long suction for a centrifugal sand pump. The performance was made possible by keeping the entire line below water level so that no air could be drawn into the suction line. By the time the material within reach has been exhausted a flood will bring down a new lot and the operation is started over.

Operating Difficulties

Because of the river conditions it is impossible to use a screen over the suction and so a 6-in. elbow has been used instead. This has a tendency to catch oversize pieces before they get into the pipe line; that is, anything which will pass the suction will pass the rest of the pipe.

A 50-h.p. engine is used on each of the pumps. The sand is pumped to a 3½-in. screening cloth above the car to be loaded. This rejects the sticks and leaves and the water and sand deposits in the car. A box is built up over the hopper of the car so that a passageway will be given the water during the loading. When the car is full the box is removed.

A railroad siding is provided so that 15 cars may be loaded without the aid of a switch engine. The empties are on the track above the pumps and are rolled down by gravity to the outgoing yard below the pumps.

Will Build Large Floating Dredge

This little plant has a daily capacity of 300 tons of clean, washed sand, which is shipped all over central Georgia. The disadvantages of the present arrangements are that the operation is interrupted by high water and that there is some trouble with the use of so long a suction line.

When the river rises to the pumps the operation must stop and in order to get a low suction head, the pumps must be mounted near the water level. When a rock or large piece does catch past the rejection elbow in the suction line it is necessary to bring the whole line above water and take off section at a time till the rock is located. Invariably the rock will be in the last section and when pipe line is 300 ft. long it is several hours' work to locate the trouble and resume operation.

For these reasons and because the demand for sand will justify a larger installation, the company is going to build a floating dredge with 8 or 10-in. pumps which will have a capacity of 1,000 tons per day.

Eden Taylor, Jr., is president of the company and B. B. Taylor is secretary, treasurer and general manager. Besides being a sand producer, the Macon Fuel & Supply Co. operates a large retail yard in Macon for builders' supplies and coal.

Eastern Market for Building Material Practically Closed

EASTERN BUILDING MATERIAL PRODUCERS ARE HINDERED BY LABOR TROUBLE, UNDER PRODUCTION AND LACK OF TRANSPORTATION FACILITIES

WITH ONLY five out of twenty-two masons' supply yards in New York open and supplies of building materials in those being rapidly exhausted because of the railroad strike, construction work of all kinds faces a week of narrowing activity.—The Dow Service Daily Building Reports says.

The railroad strike has, of course, tied up all incoming supplies of building materials and were it not for the Hudson River mills, cement supplies would have been cut off last week. As a matter of fact there are very few cement companies that will take any more business. The delivered price of this product, which could not be quoted as applying to the trade in general last week was made at \$3.80 a bbl. This price represents an increase of 40 cents a bbl. over quotations of April 1.

When the railroads proved unable to deliver replenishments of building materials in this market, distressed contractors who were face to face with having their jobs stop for want of supply of basic commodities made inducements to building material distributors to insure continuation of material deliveries from stock on hand. In every case all these bonuses were refused, with the result that although the supply of building materials in this market is nearing the point of complete exhaustion there has been no skyrocketing of prices.

When the dealers were unable to make deliveries out of their yards because of the strikes of their drivers, contractors hired enclosed moving vans and brick, lime, cement, plaster, and sand and gravel were delivered in caravans of four, six and eight at the various building sites.

On the surface of the building material market situation there is a veneer of gloom. But it overlies a sub-strata of confidence that out of the present unprecedented difficulties of doing business in the building construction industry there is being created such a vigorous public sentiment that to delay new construction work for reasons even approximating selfish gain or indifference to the public interest, the offender will be pilloried in terms synonymous with those applied to organizations or individuals who were not sympathetic with the country when it faced a great crisis.

The 1920 building season is being frittered away. Building material production in many departments is being stopped by this "snowballing" process either in the mills or in the railroads. Neither this spring nor next summer can now promise much alleviation of the already acute housing and commercial space shortage, because it does not at present seem possible to either produce enough building materials, transport that which is produced or to assemble that which is delivered in time to meet much more than 30 per cent of the demand by the first of January.

Motor Trucks for Transportation of Rock Products

Both Heavy and Light Trucks Extensively Used, But Only in Exceptional Instances Do They Compete with Railway Haulage

JUDGING FROM STATISTICS gathered from subscribers of ROCK PRODUCTS, just about half of the cement, lime, crushed-stone and sand and gravel plants of the country operate one or more motor trucks. Single companies making returns operated all the way from one to 60 trucks, the average per operator being about four.

What Trucks Are Used?

The most popular heavy duty truck is the Pierce-Arrow. One-fifth of all those reported were of this make, and excellent records of performance are given. The next most popular heavy duty truck is the Packard, which comprised about 16 per cent of those reported. The White, with 7 per cent of the total, came next. These three makes of trucks together constitute about 44 per cent of all those reported.

All these trucks are, of course, made by old-established manufacturers, which accounts in some measure, probably, for the larger number of them in use. But the figures also show that only the largest and most strongly built trucks are used to any great extent for hauling such bulk commodities as sand and gravel and crushed stone. Altogether, 43 different makes of trucks were reported in use by rock products producers and dealers—in fact, all of the different makes of both heavy duty and light trucks were well represented.

Many Light Trucks Used

One of the most surprising points brought out was the extent to which Ford 1-ton trucks are being used for handling sand, gravel and crushed stone. Nearly 12 per cent of all trucks reported were of this type. One operator alone has a fleet of 18 of these light trucks.

Nearly every plant operator has use for at least one light truck as an adjunct of his shop and repair department. Another common use of the Ford and other light trucks is for hauling men to and from the plant. One quarry operator uses one of these small trucks for hauling 14 to 16 men $3\frac{1}{2}$ miles each way to and from work daily. He also uses the truck to make crushed-stone deliveries at nearby points, although this plant until this season has been exclusively a railroad shipper.

Most Popular Size of Truck

The 5-ton truck is way ahead of all other

sizes in popularity, making up 44 per cent of all those reported. Many of these trucks carry regularly an average load of 7 tons of crushed stone or sand and gravel. The next sizes in popularity are the 3 and $3\frac{1}{2}$ -ton, which constitute about 20 per cent of all those reported. The 3 to 5-ton sizes together comprise about two-thirds of all the trucks reported. About the same percentage each of 1-ton and 2-ton sizes are used—namely, about 16 per cent, the $1\frac{1}{2}$ -ton size being the least popular.

Of course, most of the heavy trucks are used on city pavements. The big fleets of 5-ton and $3\frac{1}{2}$ -ton trucks are in nearly every instance owned and operated by producers in the large cities like Detroit, Pittsburgh, Philadelphia, etc., where there is a waterfront delivery of the materials in bulk. There are many instances, however, where operators haul from their plants on the out-

THE MOST POPULAR truck

in the crushed-stone, sand and gravel industries is the 5-ton, end-dump type. About 44 per cent of all the trucks reported were of the 5-ton size; and the 3 and $3\frac{1}{2}$ -ton sizes constituted 20 per cent of the total. In general, the best and highest priced trucks are the most popular.

skirts of a city and the haul includes some traffic on ordinary dirt road.

Relative Advantages of Heavy and Light Trucks

There is a pretty general feeling that light trucks have a distinct usefulness where roads are none too good and in cities where there is a large retail trade. A sand and gravel operator in a rapidly growing Middle West city covers both these points very fully in the following letter: "We have been in the retail sand, gravel and cement business in this city for about twelve years. Have been operating trucks for eight years. Have never owned a team of horses and wagon.

"Up to five years ago we had mud roads to our plants and trucks were not a success. We made the mistake of buying trucks which were too large for our conditions. As we now look back on our experience we can see that had we used smaller trucks we could frequently have operated on our mud roads at a time when the big trucks could not move. At the same time there is economy in big trucks when they can be used.

"It costs no more for a driver on a big truck, and it costs less per ton haul for the original investment cost, tires, gasoline, etc. However, the big trucks must stand still frequently because the places where material is to be delivered cannot be reached with a six to eight-yard load of sand.

"We became rather disgusted with the truck game and had thought we would wear out the old fellows and give it up. However, after paving the road to our plant and putting in loading chutes, we found that our customers, in order to speed up delivery of material to them, began to buy trucks. In the past we had never delivered more than 25 per cent of our sales. Our customers had done their own hauling in most cases. When we saw how well our customers' trucks were working we disposed of all our old-time junk and placed an order for one-half dozen new Master trucks of 2-ton and $3\frac{1}{2}$ -ton capacity, some equipped with side-dump bodies and others with rear dump."

This operator, it will be seen, compromised on an intermediate size, based on his own experience with 5-ton trucks and his customers' experiences with lighter ones.

In all the replies received no fault was found with any trucks except the very light ones. Ford 1-ton trucks are criticised as being expensive in engine-oil consumption, having too weak a steering gear and being too weak in the front springs. A considerable number give the answer "too small" as the fault to be found with this size of truck.

On the other hand a large Nebraska sand and gravel and crushed-stone producer has a fleet of 18 Ford trucks in operation, has no fault to find with them, and is able to use them for 10 per cent of his former rail shipments. This, however, is a rather exceptional case and where operators have used both light and heavy trucks under the same conditions they are almost unanimously in favor of the heavy truck—not less than one of 3-tons rated capacity.

There was no instance cited where an operator got less than the rated capacity of his trucks, and overloads of 25 per cent are common practice. Trailers are used only in exceptional cases. Many city ordinances prohibit their use on city streets. For city delivery, which represents the bulk of the statistics, they have a number of objectional features.

Economic Limit of Haul

There is much more unanimity of practice and opinion regarding the economic limit of haul for such low-priced, bulky commodities as sand, gravel, crushed stone, lime, plaster and cement, than one would ordinarily guess. The average, one-way haul, based on several hundred returns, is almost exactly 3 miles for crushed stone, sand and gravel, and 5½ miles for the more valuable cement, lime and gypsum.

The longest one-way haul reported for crushed stone or gravel was 12 miles. Were the tonnage hauled taken into account it is probable that 3 miles would also be about the average figure.

Only a comparatively small percentage of operators who reported their average one-way haul ventured an opinion as to the *economic limit* of haul. These estimates varied from 3 to 30 miles, the average being 7½ miles for sand, gravel and crushed stone, and 12 miles for cement, lime and gypsum.

Cost of Motor-Truck Transportation

It was expected that ton-mile costs of motor truck transportation would show a wide divergence of results. It was also developed that many operators do not know these costs. The figures asked for in the questionnaire were total costs, including overhead and depreciation; and only those figures were used in the summary that indicated total costs.

These estimates of the per ton mile costs of transporting crushed stone, sand and gravel varied all the way from 12 cents to 65 cents, with an average of 26 cents. Of course a true average would have to be arrived at by taking into consideration the tonnages moved in each case, but judging from all available data a per ton mile cost of motor-truck freighting of about 25 cents is fair. As proof of this is furnished by a number of plant operators who give data regarding hired trucks. One large city sand and gravel producer in the Middle West gets his trucking done for 28 cents per ton mile, while a New Jersey operator gets his for as low a price as 9 cents per ton mile, but this is entirely over paved roads.

If it averages \$25 a day to keep a 5-ton truck in service, including all charges, as some operators state, it means that the truck, in order to move material at 25 cents per ton mile, must average 100 ton miles a day or 14 one-mile trips with a 7-ton load, or 7 2-mile trips, or 5 3-mile trips. Dif-

ferently stated, the truck would have to average between 14 and 15 miles with a 7-ton load. As a truck is easily good for 65 miles a day it will be seen that the figure of 25 cents is conservative for the largest size trucks.

One operator of 1-ton, 2½-ton, 3½-ton and 5-ton trucks has made a close study of haulage costs, arriving at the following results: 39c. per ton mile for the 1-ton; 14c. for the 2½-ton, 12¾c. for the 3½-ton, and 11½c. for the 5-ton. He carries a 6-ton load on his 5-ton trucks, a 4-ton load on the 3½-ton trucks and a 3-ton load on the 2½-ton trucks. He operates over both paved and dirt roads and city streets and with an average one-way haul of 12 miles, with a maximum one-way haul of 50 miles and a common one-way haul of 30 miles.

Life and Depreciation of Trucks

The average charge for depreciation of motor trucks in the rock products industry is 20 per cent, although the range is from 5 to 25 per cent. The number of those who charge 25 per cent per year about equals those who charge 20 per cent, the number of those who charge around 10 to 15 per cent bringing down the general average to 20 per cent per year.

None of the operators reporting has dis-

AN ALLOWANCE of 25 cents per ton mile is evidently ample to cover the cost of motor-truck transportation of bulk commodities, like sand, gravel, crushed stone, cement, lime and gypsum. The life of a first-class truck is evidently better than 100,000 miles.

covered the life of a first-class truck even under this hard service. A 5-ton White truck purchased in 1915, which has gone 100,000 miles, is reported in good condition. A 3½-ton Packard 4 years old is reported "believe it good for 6 years more." An operator of 22 Pierce-Arrow trucks reports: "Our first truck purchased eight years ago is still in good operating condition (approximate mileage 110,000). Another says: "Our first truck, purchased in May, 1915, is a 5-ton Pierce-Arrow. It has gone 51,400 miles and is still going strong."

Of course, the life of a truck depends both on the character of the roads it is used on and the care given it. Generally the operators express the opinion that a well-built truck should be good for 100,000 miles, and the experience given substantiates this. There are many cases of 40,000, 50,000, and 60,000 mileages without the trucks showing appreciable loss of usefulness. Hence a depreciation of 25 per cent should be ample.

Competition with Railways

There are a number of instances where motor trucks hauling crushed stone, sand, gravel and slag are actually handling business that formerly went by rail, but these are exceptional cases. It can be easily seen, however, from what has already been said regarding economic limit of haul and ton-mile costs, that only a very small proportion of the total tonnage of rock products can ever be handled by motor trucks in competition with the railroads on hauls of more than 5 miles.

There are instances, like that referred to in the case of the Universal Portland Cement Co., in *Rock Products*, February 28, p. 28, where hauls of over 20 miles from mill to job cost no more than loading freight cars, freight charges, unloading and warehouse charges and dealers' commissions combined. For instance, another cement company, in the South, was able to move 60 per cent of its entire February output to a nearby city (5-mile one-way haul) as against 40 per cent, which it was possible to ship by rail, owing to car shortage. A 3-ton truck and trailer, which, together carried 30,000 lbs. per trip, did the business.

There are also a number of instances, particularly in Ohio, where agricultural lime and limestone producers located in farming country have found it advantageous to make deliveries by truck within a radius of as much as 18 miles. However, it is difficult to convince the average farmer that hauling costs him anything if he does it himself, whereas a contractor buying lime or cement can readily appreciate the saving in rehandling costs that are effected through truck deliveries from plant to job.

Producers as Retailers

As already pointed out, the big users of motor trucks are sand, gravel, crushed stone and slag producers, who have plants within a 5-mile radius of big cities, or have their material delivered to the city water fronts by boats. A few producers adjacent to large cities are fortunate enough to be able to do an f.o.b. plant business—their customers doing the hauling. A considerable number hire their hauling done, but by far the most of those who are financially strong enough to make the investment own and operate their own fleets of trucks, even though in times of exceptional demand they may also hire many more.

The foregoing data would make it seem that unless the trucking can be contracted for at less than 25 cents per ton mile, it is cheaper to operate one's own fleet of trucks. The experience of the producer, whose letter regarding the economical size of truck to use has already been quoted from, states his experience as a retailer as follows:

"After putting these 2-ton and 3½-ton trucks into operation we found that we delivered a large per cent of our sales. Every-

April 24, 1920

Rock Products

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thing indicates that the present year will show that we are delivering from 60 to 70 per cent of our sales. Also we are reaching out into portions of the city we heretofore could not reach because of the enormous expense of team and truck hire.

"In the past when we had an order from some distant part of the city which required as much as a carload of material, we switched it over to some convenient point and unloaded it from the car to the job. It takes time to do this because the cars cannot be handled over night. By the time we order in the car, load it and get it switched there is usually five or six days consumed. Now, however, we simply shoot the stuff over with the trucks and get it there the day it is ordered. During the past season, in addition to our own trucks, we hired a great many. At times we were running from 12 to 15 trucks per day which we were hiring from other people.

"We find that the trucks do not save us a big lot of money, but they help sell a lot of material by enabling us to cover a wider territory and give a service which cannot be given when we deliver in the old style way.

"We give our drivers a prize each month for the most efficient service. This takes into consideration the gasoline, oil and repairs they use in producing a certain result. We charge each truck up with its operating cost and credit it with what it would have earned on our zone system of paying for delivery, if it had been a truck belonging to others but working for us.

"Our card requires the driver to show the amount of gasoline and oil used each day, the time of starting, time of quitting, total time in operation, time lost making repairs when he should have been hauling, and time consumed in making repairs when the truck was not otherwise busy. Then the garage foreman shows the repairs made and new parts or materials used in making repairs. Then the earnings of the truck are shown. One card covers one week, and there is a separate line for each day of the week. Each driver carries one of these cards in his ticket clip and fills it out each day and turns it in Saturday night."

Unique Uses for Trucks

One operator reporting uses a motor for spotting railway cars at his plant; this is practically the only use he makes of it. At least one quarry operator uses trucks for moving stone in the quarry from shovel to crusher—an average distance of about 1500 ft. The trucks used for this purpose are 2-ton end-dump Autocars. A fleet of six of these handle both rock and stripping.

A Middle West quarry operator is about to introduce motor trucks for quarry haulage and a Montreal operator is planning on using two 7-ton side-dump trucks with steel-tired rear wheels between his shovel and crusher.

Georgia Trap Rock Development

The Talbotton Trap Rock Co. Opens the First Trap Rock Deposit of the Southwest Section

THE TALBOTTON TRAP ROCK CO., Talbotton, Ga., represents the only trap rock operation in Georgia. Although that state has a sprinkling of small trap rock deposits, either because of inaccessibility or size of deposit, this is the first one which is being opened.

According to tests made by the Pittsburgh Testing Laboratories, Pittsburgh, Pa., and the Georgia School of Technology



President C. K. Mahone and Superintendent E. L. Church

the rock is an excellent grade of trap and will be able to compete with the granite of the district as far as toughness and wearing qualities are concerned.

The deposit is in a hill side deposit 100 ft. above the water level and according to C. K. Mahone, president and general manager, the company will open up a face this entire height. The only objectionable feature of the deposit is that it is a boulder formation and will always have to be a hand loading operated quarry because of the considerable clay around the boulders.

At the time when the plant was visited the crushing plant was only under construction and the quarry had not been opened. It is the plan of the company to install a small plant to test out the actual worth of the deposit and to develop and expand the plant as the deposit shows its worth and the market demand shows need.

The accompanying view shows the plant under construction. An 18x40-in. jaw crusher is being installed to do the crushing and the separation will be made in a 40-in. by 18-ft. screen. A 150-h.p. boiler, 70-h.p. engine and an air compressor will compose the machinery installation. The crusher, elevator and screen are all shaft driven from the one engine.

The plant layout is such that the output may be increased later by the addition of other crushers from time to time.

The officers of the company are C. K. Mahone, president and general manager; A. J. Perryman, Jr., vice president; J. H. Mahone, secretary, and E. L. Church, is the superintendent in charge.



Construction view of the Talbotton Trap Rock Co.

Broken Bolts and Screws

Trouble Caused by Broken Foundation Bolts, Studs, Bolts and Fittings Results in a Loss of Time—Only Remedy to Such Mishaps is to be Ready to Meet the Emergency

VERY TROUBLESOME are foundation bolts broken off flush or inside of the concrete foundation; additional strain cannot always be imposed on the other bolts to hold for the missing one, and the repair must be made. In many of these foundation bolts no provision is made in case of break; they are grouted or cemented so tight that no one can tell how far down they extend.

Repair of Broken Bolts

Two of the foundation bolts of a large compressor broke, one flush with the concrete, the other about 10 in. in the concrete. The bolts were 1 1/4-in. mild steel and the break was caused by flaws.

The first broken bolt was center-marked with a center punch and a 1/4-in. hole was drilled about 1 1/2 in. deep, to keep the larger drill in the center of the bolt and from running into the concrete. The bolt was bored first with a 7/8-in. drill to a depth of 6 in., then bored with a 1 1/4-in. drill to a depth of 4 1/2 in. The drill shavings were taken out with a curved piece of iron and a magnetized round file. The 7/8-in. part of the hole (Fig. 1) was tapped out to 1-in. standard bolt thread and a piece of 1 1/4-in. soft steel turned down and threaded to fit in the bolt, and the upper part threaded for a 1 1/4-in. nut.

For the second bolt a piece of 1-in. pipe was forced in the hole in the concrete to guide the drill in the center (Fig. 2). A 1-in. drill was first used, drilling to a depth of about 1 in. to give a start for the tap and a center for the 7/8-in. drill. The hole was drilled and tapped like for the other, the 1-in. pipe left in place and sawed off even with the cast base and a 1-in. stud of the required length was made to fit. To insure a permanent tightening the threads of the lower part were washed with gasoline and smeared with a mixture of sal ammoniac (by weight) 2 parts, flour of sulphur 1 part, wet iron filings 100 parts. The studs were made tight in place with double nut.

When a foundation bolt held by a cast washer in the concrete breaks off right at the head it is taken out, split with the hacksaw at the broken end, annealed and an iron wedge made (Fig. 3), the bolt being driven back into place. The grip is made by driving the bolt over the wedge, thus spreading the end. If there is danger of the wedge dropping off before the rod reaches its place, solder the wedge at "A" or drill a 1/16-in. hole

By Charles Labbe

Mechanical Engineer, Johnnie, Nev.

through rod and wedge and put a piece of copper wire through; either will part at the first blow when hammering the rod with the wedge resting on the bottom.

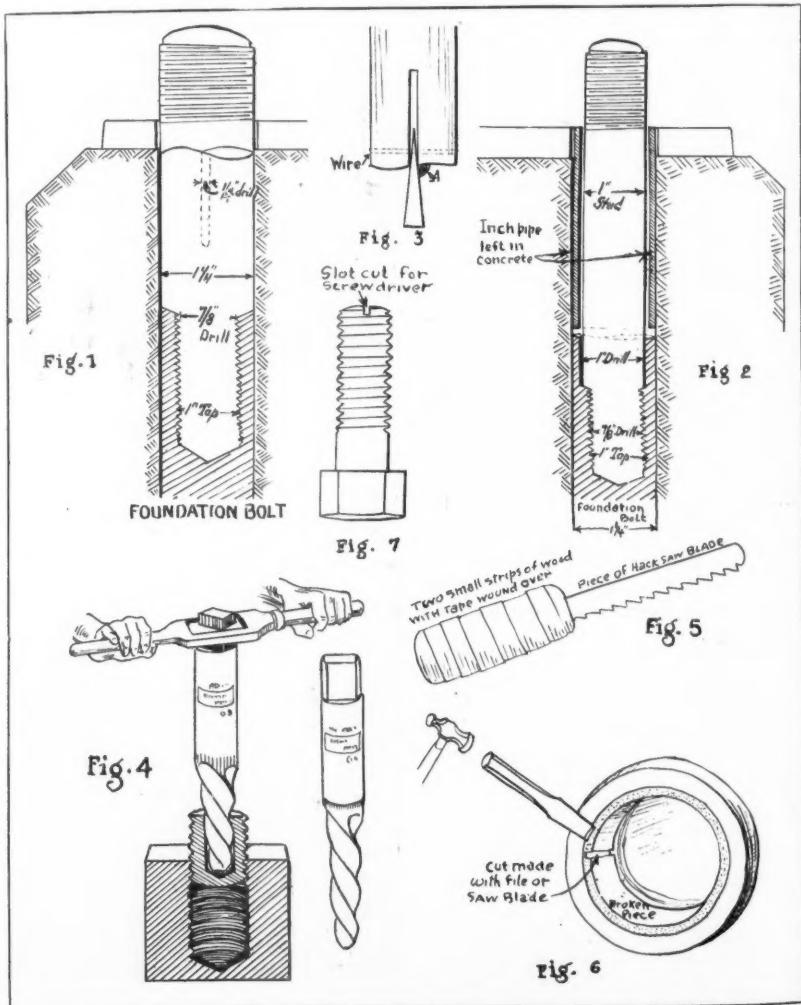
In case of emergency a hole could be drilled in the concrete with the jack-hammer, next to the casting to a depth of 20 to 30 diameters, and a bolt set in with a plate on the top, but this would not look very artistic in a modern power plant.

Broken Studs

In machinery broken studs are taken

out by drilling a hole slightly smaller than the inside of the threads and cutting the remaining loose threads with a narrow cape chisel or by using a tap of the thread size. If the stud breaks off somewhat away from the casting, put the blowtorch on it for a minute or so to get it a trifle dark red and while cooling put engine oil around it; some will work into the threads, the expansion and contraction will also help to loosen it up, and by using a small pipe wrench on the projecting part of the stud it will come out.

Studs or set screws twisted off or broken can be unscrewed in the shortest time by using an "Easy-out" screw extractor; this is a tool made in different



sizes especially for that purpose (Fig. 4), a hole is drilled in the screw, the tool slightly driven in and with a tap wrench just unscrew the piece out. Those tools cost from 50 cents to a dollar, according to size, and often pay for themselves at the first use.

Sometimes broken studs, large ones mostly, are unscrewed with the help of a diamond-point chisel and a hammer.

Pipe Fittings

A common occurrence of broken pipe threads is often met with in fittings; to remove the few threads left depends mostly on the accessibility of the pipe. A cut is made on the inside of the broken piece with a small sharp-edged file or a tool made with a piece of saw blade (Fig. 5) and two strips of wood, held by wrapped tape. Hammer slightly around the fitting and with a cape chisel (Fig. 6) hammer one side in and the piece will come out easily. After taking out a broken piece it is advisable to run the tap in, or a nipple, to smooth any roughness and clean the threads before screwing in the new piece of pipe.

Cap Screws

In engines, pumps or compressors often one of the cap screws holding the connecting rod's adjusting wedges breaks, either in running or in making adjustments. A very good way to do before putting in these capscrews is to cut a slot for a screwdriver at the end of the small part (Fig. 7), so if one part breaks the other can be taken out by a screwdriver inserted in the hole and the broken piece screwed out. This ought to be done by the builder and not the repairman.

In case of a broken cap screw in the connecting rod at the crosshead end, the pin must be taken out in order to move the connecting rod to get room to remove the screw.

In the engine room there ought to be kept on a board, wired or nailed, extra gaskets and cap screws to duplicate those on the engine which are liable to break. I have seen more than once a pump or compressor stopped just long enough to take up the bearings, when a cap screw would break and by the time another was found or made, the department waiting wondered "when the strike would be called off."

Cap screws as taken from the stock are far from perfect, the head is quite small, and the material is generally a cold-drawn steel which twists off easily. They are somewhat crystallized and their service on moving parts is more dependable if they are annealed.

Improvised Thread Cutter

I remember of a shipment of 1½-in. anchor bolts sent up into the hills, sepa-

rate of nuts. When the nuts were tried on, they would not start; by measuring we found that the bolts were 1/32-in. oversize and the nuts standard size. There were no dies nor a lathe to turn the threads down so we resorted to the following emergency. The threads were filed down with a flat file and by using a three-wheeled pipe cutter the threads were cut deeper. For a die one nut with six grooves cut with a thin, flat file and case-hardened with cyanide and a little salamoniae and dipped in salt

water (everything to get all the hardness possible) was used.

For all studs and screw ends made on the lathe, turn down the first thread; it will be so much easier to start the screw or nut straight. If you hammer the end a little it will not batter up the first thread, and it will add much to the finished appearance. Also cut down the first inside thread (large end) of a pipe fitting. It is of great help if someone has to hold the pipe, and there is much less chance of starting crossthread.

Combating Car Shortage

What Aggregate Shippers Should Do in the Event of a Car Shortage

IN A RECENT trip to Washington, E. Guy Sutton, Business Manager of the National Association of Sand and Gravel Producers, made an appeal to the Commission on Car Service of the American Railroad Association for the protection of the movement of sand and gravel for road building work as well as for other purposes during the season of 1920.

The results of this negotiation are set forth in the following, which was taken from a bulletin by the National Association of Sand and Gravel Producers.

"A co-operative plan was effected with the Commission on Car Service for handling complaints of shippers of sand and gravel, when they are not able to secure a satisfactory car supply from the railroads on which their plants are located. The proposed method of procedure is as follows:

"(1) Make request for the number of cars wanted through the local agent; (2) If cars are not furnished, apply to the division superintendent; (3) If then cars are not obtained, make appeal to the general superintendent; (4) In the event relief is not granted after taking the foregoing steps, present complaint to the National Association, and your case will be submitted promptly to the Commission on Car Service for attention.

"In further explanation: The Commission on Car Service was voluntarily organized by the American Railroad Association. At the present time it serves as the point of contact between the Interstate Commerce Commission and the railroads, and no doubt this relationship will be continued as long as the orders of the Interstate Commerce Commission respecting car service are obeyed by the railroads when transmitted through the Commission on Car Service.

"It is emphasized again that the shippers of sand and gravel should work out their car supply problems, so far as possible, with the officials of the railroads. It can be borne in mind, however, that with war conditions eliminated, all ship-

pers are entitled to share alike in the distribution of available equipment except in the case of an emergency, when so declared by the Interstate Commerce Commission.

"The National Association stands ready to protect your rights with respect to car supply when assistance is required."

Texas Is Tending Toward the Concrete Type of Road

AUSTIN, TEXAS.—According to C. N. Avery, commissioner of construction of the State Highway Department one of the outstanding features of the good roads work that is now being done in various parts of the state is the increase in the construction of concrete highways. In the Lower Rio Grande Valley, where only a few years ago narrow trails were the only routes, contracts have been awarded for building nearly seven miles of concrete highway. This is to be the first unit of a system of that type of roadway that is to extend all through the Lower Rio Grande Valley, it is stated.

During the first 3½ months of this year contracts involving the expenditure of approximately \$4,300,000 for the construction of new highways in Texas were awarded, and in addition to this sum bids have been advertised for \$4,500,000 of work on projects for which bonds have been issued. This makes a total of \$8,800,000 of highway construction that will be under way within the next few weeks.

The contracts already awarded since the first of the year provide for the construction of 261 miles of roads and include 31 miles of concrete pavements, 59 miles of bituminous surfacing roads, 151 miles of crushed rock or gravel surfacing and 20 miles of shell, besides two separate bridge projects in Stonewall and Runnels counties.

The projects will receive state and Federal aid amounting to \$1,350,000. The 290 miles advertised for lettings during April in 18 additional counties have aid allotted to the amount of \$1,675,000.

Advertising Literature for Sale of Agricultural Lime

Preparation of Advertisements, Circulars, Booklets and Letters That Will Appeal to Farmers

THREE IS NO QUESTION of the aid rendered the sale of commercial articles to farmers by well written and prepared advertisements and circulars, or literature in the larger sense. The farmer is first of all an individualist; he is one who in times past was taken advantage of by those who had articles of doubtful value to sell. The book agent, the map agent, the unscrupulous seed and fertilizer dealer have visited his door once too often. Today he wants to know what he is spending his money for. The advertisement and circular helps to bring this knowledge of individual articles of commerce to him. They help to satisfy his investigative mind and prepare the way for sales, and in many cases make the sales, leaving only the necessity of a live agent to collect them.

It has been my pleasure to prepare much circular and advertising material and to edit much more. In some cases I have had the privilege of watching results and noting the character of the literature which proved most successful, not only in developing sales territories, but also in creating a friendly attitude on the part of farmers toward various commercial enterprises introduced by these means.

Two Types of Advertising

It is my opinion judging from experience with quarry products, lime and limestone, prepared manures and fertilizers, that the time is rapidly approaching when literature by any company dealing in these products must be distinctly of two types. One type which sells or explains the nature of the article and one which renders service or tells of the advantages to be gained from the use of the article as well as suggestions regarding its use. These types of literature may be, and often are, combined in a single circular and in this way meet the demands of the time very well but they allow less follow-up features or possibilities.

It is one thing to sell an article once but another and very different thing to sell it every year without additional effort. This is the aim of "service" literature. It may be argued that a service bureau representing an industry serves this purpose sufficiently well, but such an organization simply tends to increase

By John H. Voorhees

Associate Editor "Pennsylvania Farmer,"
Philadelphia, Pa.

the consumption of a given article of commerce through a more general knowledge of its usefulness. To prove this one needs simply to point to the Portland Cement Association. But such an association leads to no particular or individual achievement on the part of any company. It builds no clientele. It presupposes individual effort.

Physical Attractiveness Important

Regardless of the nature of the reading matter and the motive prompting the preparation of a circular or an advertisement, there are a number of fundamental principles which require preliminary consideration. Appearance is of vital importance. A few words with an attractive picture on good paper will lead many a farmer to read what would otherwise follow the course of least resistance—the waste basket route. Something attractive is needed to impel a farmer to pick up a piece of literature and read it no matter whether it is on the handy shelf at the dealers' or whether it comes in the mail. A general truth or some saying of proverbial nature embodying a moral or practical precept, a maxim in others' words is often valuable in this respect, especially if it is in common usage and applies to the case in hand.

The size of type used is very important, not alone on the frontispiece, but throughout the copy, because most reading is done on the farm after the day's work is done, and often under poor lighting. Large type with many subdivisions is desirable. Many circulars go unread because they are too long and too big and clumsy. About 1,500 words prepared in a pamphlet 3x6, 4x9 or 6x9 to fit regulation size envelopes should meet all requirements from the point of view of the manufacturers. They are easily read by the farmer. Short paragraphs and short sentences are essential which, with the introduction of photographs and charts, make the ideal. The photographs should be used to show scenes of growing crops and the like, while charts should be used to show

comparisons of yields, prices, net incomes, costs, and the like.

Must Be Educational

Above everything must be placed the subject matter. Plain statements, preferably of facts, are always to be desired. These statements should ordinarily be above the farmer; that is, they should contain information, a part of which at least is new to him. But they must be written in plain style which is readily understood by him and always in his own language. Technical matter is not easily understood and the farmer tires of it after a paragraph or two. Yet, excerpts from the bulletins of agricultural experiment stations, even though they be technical, may be made very valuable in sales promotion work, provided they are properly and honestly explained. They carry a certain moral weight that often results in direct sales.

Too much commercial literature is too sober. It needs something to brighten it up. Quotations, proverbs, bits of poetry, cartoons and jokes may be used for this purpose. They may be worked into the subject matter if they relate to it or they may be used as fillers if they have no relation to the subject matter. Another good method of injecting some liveliness into a circular is through the use of personal material. Conversations would be good if it were not for the fact that few of them are genuine; and this is easily detected. In some cases letters from purchasers or satisfied customers are good, but suspicion surrounds these also. The best means is through the use of a personal story—the experience of some one individual told by a farmer tongue. Many farm journals today are building up their circulation on personal experience stories. Usually these are short and may be worked into the body of the pamphlet.

It is true that literature of this character should be dignified. Some will argue that the foregoing procedure will injure this quality, but this is a mistaken idea. Dignity may be expressed by other means than by the sobriety of an experiment station bulletin which is so dead and dull in appearance, subject matter and make-up. To follow such a style is naught but folly and a relic of the Civil War days when Justin Morrill made the

state colleges and experiment stations possible.

Statistical Data

It has been said that there are lies, *d-d* lies, and statistics, and yet there is no better way of making arguments convincing if it is done properly. I have heard speakers before agricultural meetings tell how the prevention of disease on potatoes could be controlled by spraying and how it would result in several million dollars of saving annually to the growers and then add to this the figures for each different crop and continue along the same idea for half an hour or more. Such material is not interesting or helpful to the farmer. He is interested in home acres, in his community, his county and his state. He is not used to large figures and they mean little to him. He thinks in terms of acres and crops.

If it is possible to reduce statistics to this basis and give them some local color or application they are convincing. But the figures in themselves are dry, dull and uninteresting. If they can be charted so as to appeal to the eye they are very effective, but here the problem of making them understandable becomes a factor. It is probable that even Brinton's graphic charts would be too complicated.

The consideration of greatest import is the territory in which the pamphlet or literature is to circulate. It is usually well to start with a small territory, say a county or a group of two or three counties as a nucleus and build upon this as time goes on. If this is done it is possible to use one or more of the counties selected as a unit and adapt the material to the use of this district which is familiar to all those living within it. This presupposes a knowledge on the part of the author of the people and of the character of farming. Often a slight error will destroy the confidence of the reader and lose his friendship.

If, on the other hand, the circular is to have a wide circulation among different peoples and different types of farming, it must necessarily be confined to general statements or to information regarding the article advertised, or to the principles which are true under any and all conditions. Otherwise each statement must be qualified. This makes a cumbersome, uninteresting article which largely defeats its purpose.

It follows then that trade literature to accomplish its purpose must be attractive, short, interesting, teeming with life and personality, *curt*, to the point, easily read, and above all a plain statement of facts. It must represent and not misrepresent.

(A good example of literature which answers these specifications is that being circulated by the American Limestone

Rock Products

Co., Knoxville, Tenn., described in Rock PRODUCTS of April 10, p. 44.—Editor)

Farmer's Phosphate and Limestone Storage Plant

PULVERIZED ROCK PHOSPHATE AND LIMESTONE should be spread on the soil in the fall of the year after the small grain is harvested, but the inevitable car shortage due to the movement of grain and coal at this season makes it difficult for the farmer to be sure of the date of arrival of a car of fertilizer and so cannot plan his work accordingly. Even if he is fortunate enough to have a car delivered some where near the time it was promised, the weather, condition of the roads or local causes may prohibit the unloading of it for several days, resulting in demurrage charges, with the alternative of unloading it on the ground, with a certain

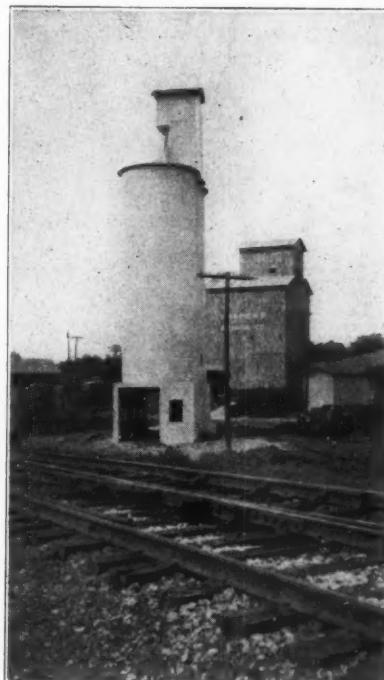
is possible to get by the single carload. It is delivered at any time of the year and is unloaded, weighed and sold by the operating force of the grain elevator company, who also look after the operation and maintenance of the machinery.

The plant is composed of two cylindrical bins 14 ft. inside diameter and 40 ft. high, with a driveway beneath, gates in the roof of the driveway allow the material to be drawn off into wagons beneath, cast-iron poke-hole frames of special design are provided alongside the gates through which the material may be agitated in case it arches over the openings and refuses to flow; this often occurs, as phosphate is so fine that it acts in a manner similar to bulk cement. The gates are a quick-closing type to guard against a sudden surge of the material tending to flood the man and team below.

A centrifugal chain and bucket elevator is located between and to one side of the two bins, the triangular space formed by the bin walls and an outside wall forming the enclosure. An electric motor, located in the cupola, and connected to the head shaft of the elevator through a chain and sprocket drive furnishes the power for driving. The material is shoveled directly from the car to the boot of the elevator and from there lifted and discharged into either bin by throwing a two-way switch gate at the junction of the spouts to the bins.

This plant is the first of its kind built and operated by a farmers' organization; the credit for the success of the venture is due to John Collier, County Agricultural Adviser for the Kankakee County Soil and Crop Improvement Association, and to Luther W. Smith, one of the large land owners in the county, who is also president of the Manteno Limestone and Phosphate Co., a subsidiary of the association, which owns and operates the plant.

The design and complete machinery equipment was furnished by S. G. Artlingstall, Jr., Mechanical Engineer, Old Colony Bldg., Chicago, and a local silo builder contracted for the erection.



Reinforced-concrete bins for storage of ground limestone and phosphate rock

loss in reclaiming, as well as the double work and expense involved.

To overcome this difficulty the progressive farmers of Kankakee County, Illinois, have erected at Manteno, a reinforced concrete storage plant, having a capacity of 600 tons, as shown in the picture accompanying this article. It is located adjacent to the local grain elevator so that when the farmer brings in a load of grain he can carry a load of fertilizer back to his farm on the return trip.

The phosphate is contracted for in quantities at a much lower rate than it

National Lime Association Experiments on Corrosion

A N INVESTIGATION is now under way in the laboratory of the National Lime Association to determine the effects of various materials, including lime plasters and concrete mixtures containing lime upon the corrosion of steel used as reinforcement.

Several series of test slabs embracing a number of mixtures in common use are under observation. Results of this investigation will be available, to those who may be interested, in about three months' time.

Handling Limestone at Kosmos Portland Cement Co. Plant

AN UNUSUAL FEATURE about the Kosmos Portland Cement Co. plant at Kosmosdale, Ky., is that its quarry is 25 miles up the river from the plant. It was necessary to put the plant so far from the quarry in order to get a shipping point on the railroad and also to be able to use the Ohio River to transport the stone from the quarry to the plant. At this point the railroad turns away from the river and, since at no time does it come near enough to the quarry to make it possible to put in a spur, this was the best point for the location of the plant.

The quarry is a hillside deposit and so the stone is transported by gravity from the quarry to the crushing plant, then from the crushing plant down to a large storage plant and to the boats. Each barge has a capacity of some 500 tons and the storage is capable of loading five barges continuously. A tow boat makes a round trip per day when the weather is favorable and brings five barges down the river.

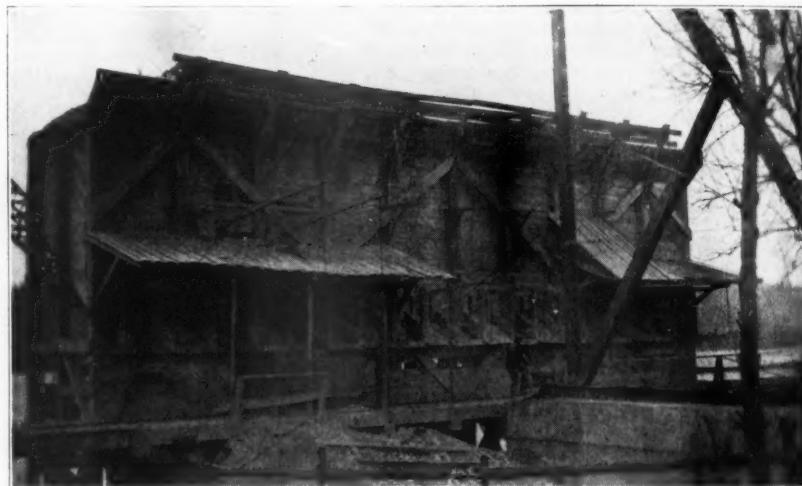
The views show the method used in handling the stone at the cement plant unloading wharf. A large stiff-leg derrick has been mounted out on the river edge so that the stone may be loaded into a large hopper bin from the barges. The barges are floated under the unloader and a 2-cu. yd. clamshell shovel quickly unloads the contents. The hopper-shaped unloading bin has a capacity of about one barge load. As fast as the material is put into the bin, it is unloaded into cable-drawn cars which run on a continuous track which passes in front of the wharf.

The stone is loaded into cars which are drawn by a cable and hauled either direct to the cement plant bin supply or to the reserve storage. Owing to the frequency with which the river becomes unnavigable for the tug and tow, it is always necessary to carry a full reserve storage, for either too high or too low water will interrupt the flow of material from the quarry.

The cars are filled at the wharf and fastened to a constantly moving cable and drawn to the storage yard. Here they are either released and emptied or emptied while in motion. This may be done very easily because the cars are so built that the sides will swing out and the contents can fall freely down into the storage. The tracks are built on trestles high up above the storage so that it may be filled by gravity. A conveyor and hopper underneath the storage enables the stone to be worked out to the cement plant. The reserve storage is operated with a locomotive clam-shell.



Unloading equipment at the river wharf



Unloading hopper showing chutes used to load cars



Delivery to the plant is made by cable-drawn cars

Practical Chemistry for Lime and Cement Manufacturers

II—Theory of the Composition of All Materials; the Chemical Elements and Their Symbols

FROM A STUDY of the composition of matter, scientists have deduced "the atomic hypothesis." A hypothesis may be defined as a working theory or rule which satisfactorily explains known facts, but which is not susceptible itself of direct proof. The atomic hypothesis or theory, while not proven absolutely has, however, been so thoroughly tested by experiment and is so satisfactory that it is generally accepted as the correct explanation of the composition of matter. According to this theory, all elementary matter is composed of very small particles, far too small to be seen with the highest-powered microscope, which are called "atoms."

The atom is the smallest particle of the element which can exist. This being the case, we cannot divide an atom, nor can we break small pieces from it. Manifestly, if we did either of these things, the piece broken off would make a smaller particle of matter than the atom and this cannot be.

All the atoms of any given element have the same size and the same weight. Since we can not sub-divide an atom we can not take anything from its size and weight, and if we added anything to it, it would have to be another atom, since nothing smaller than an atom can exist, in which event we would merely have a combination of two atoms.

The atoms of different elements have different weights and sizes. The reader naturally wonders how this conclusion is reached, since an atom can not be seen and hence separated out of the mass and weighed. Nevertheless this has been demonstrated by actual experiment, as will be explained a little further on.

An atom can not change its nature—that is, an atom of one substance can not change to one of another. An atom of gold will remain always an atom of gold, one of iron always iron. That is why we cannot change iron into gold and why scientific men have now given up the almost universal efforts of chemists of the Middle Ages to change iron, copper and other metals into gold and why they pronounce as fakers those who occasionally claim they can do this. Iron consists only of atoms of iron and gold only of atoms of gold. To transmute the one into the other would mean that the atoms of one would have to be changed over into those of the other and this we know can not be done.

By Richard K. Meade, M. S.

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We can not destroy an atom. This is of course evident from the "indestructibility of matter" theory with which most of us are familiar. When we do what is popularly known as "destroy" a substance, we merely change it into some other substance. The most popular way to destroy a substance is by burning. If we burn a wooden object we merely change it into two or more gases and an ash. All the original atoms in the wood are present in these gases and the ash.

Atoms of the same or different elements unite to form molecules. A molecule is the smallest particle of a compound which can exist and still remain the compound. Acetylene gas is composed of hydrogen and carbon. The smallest particle of this gas which can exist and still be acetylene is a molecule of acetylene. If we divide this molecule we will have atoms of hydrogen and carbon. Like the atom the molecule is much too small to be seen. Every molecule of a compound has the same composition and hence, it follows, the same size and weight. When a chemical change takes place, the molecules are broken up and the atoms unite in new groups to form new compounds.

The Law of Multiple Proportions

The various elements have a remarkable way in which they combine with each other. Thus it is found that carbon combines with oxygen in two proportions, in the proportion of 12 to 16 to form the gas carbon monoxide and in the proportion of 12 to 32 to form another gas, carbon dioxide. Similarly, hydrogen combines with oxygen in the proportion of 1 to 16, forming hydrogen peroxide and of 2 to 16 forming water. Also hydrogen combines with carbon in the proportion of 4 to 12, forming marsh gas. Whenever we find carbon combining with any element it is in the proportion of some multiple of 12, and oxygen of some multiple of 16 and hydrogen of some multiple of 1. This is known as "the law of multiple proportions," and on it hangs the ease with which the chemist can calculate with such certainty the

quantity of one material necessary to produce another.

By very careful and painstaking work, chemists have worked out the relative proportions in which the elements combine with each other and such proportions are known as the "combining weights," or more technically, "the atomic weights." Whenever two or more compounds combine it will be found that this is always done with due regard to the proportions established by these atomic weights.

Let us see how the atomic theory explains this. We can not weigh an atom but we can compare the weight of two atoms. For example: water has been found by analysis to be composed of 8 parts by weight of oxygen and 1 part of hydrogen and experiments have proved that a molecule of water is composed of one atom of oxygen united to two atoms of hydrogen. Now since every molecule of water has the same composition, it follows that there are twice as many atoms of hydrogen in any quantity of water as there are atoms of oxygen. Since the water is composed of 8 times by weight as much oxygen as hydrogen one atom of oxygen must weigh 8 times as much as 2 atoms of hydrogen, or one atom of oxygen weighs 16 times as much as one of hydrogen. It follows that as atoms unite to form molecules the proportions of the atomic weights must follow. Remember, that all atoms of the same element weigh the same and that this weight cannot be increased or diminished.

Originally hydrogen was considered the standard and given the atomic weight of 1 because it combined in the smallest proportion or had the least atomic weight of all the elements. Now it has been considered more scientific to use oxygen as a standard, but for practical purposes the beginner may still consider hydrogen as the unit of the system. Eliminating small fractions, the more common "atomic weights" are as follows:

THE MORE COMMON ATOMIC WEIGHTS

Element	Symbol	Atomic Weight
Aluminum	Al	27
Antimony	Sb	120
Arsenic	As	75
Barium	Ba	137½
Bismuth	Bi	208
Boron	B	11
Bromine	Br	90
Calcium	Ca	40
Carbon	C	12
Chlorine	Cl	35½
Chromium	Cr	52
Copper	Cu	63½
Fluorine	F	19
Gold	Au	197

Element	Symbol	Atomic Weight
Hydrogen	H	1
Iodine	I	127
Iron	Fe	56
Lead	Pb	207
Magnesium	Mg	24 1/4
Manganese	Mn	55
Mercury	Hg	200
Nickel	Ni	58 3/4
Nitrogen	N	14
Oxygen	O	16
Phosphorus	P	31
Platinum	Pt	195
Potassium	K	39
Silicon	Si	28 1/4
Silver	Ag	108
Sodium	Na	23
Strontrium	Sr	87 3/4
Sulphur	S	32
Tin	Sn	119
Zinc	Zn	65 3/4

Chemical Symbols

The reader will notice in the second column after each element there is placed an abbreviation consisting of a letter or else two letters. Chemists have worked out a system of symbols by means of which they can express briefly and exactly the composition of any pure chemical and this is done by means of these abbreviations. For each element there is an abbreviation known as its *symbol*. These symbols are usually, as will be noted, the initial letter of the name of the element, as, for example, "C" for carbon. When a number of elements begin with the same letter it is usual to use the letter alone as the symbol of the most important and either the first two letters or two important letters of the names for the others, as, for example, Ca for calcium and Cl for chlorine. Sometimes the first letter (or letters) of the Latin name for the element is used for the symbol, as, for example, K for potassium and Na for sodium, which are from the Latin words *kalium* and *natrium*, signifying potassium and sodium, respectively.

Now, for instance, if the chemist wishes to write the symbol for calcium oxide (or lime), which is composed of calcium and oxygen, he writes simply the letters of these two elements thus, CaO.

This symbol, however, denotes more than that calcium oxide is composed of calcium and oxygen. It states also that it is composed of one atom of calcium and one atom of oxygen. This also, of course, means that it contains one combining proportion of calcium and one combining proportion of oxygen. Or, referring to our table of atomic weights, the proportions are 40 parts of calcium and 16 parts of oxygen. The total of these two weights, or 56, is known as the "molecular weight." The molecular weight is always the sum of the atomic or combining weights entering into the composition of the molecular.

Water is composed of two atoms of hydrogen and one atom of oxygen or two combining proportions (or 1×2) of hydrogen and one combining proportion (or 16) of oxygen, hence the chemist indicates this in the symbol as follows: H_2O and the molecular weight is $1 \times 2 + 16$, or 18. The reader should notice that the figure 2 is written somewhat smaller than and to the right and below the letter "H." The symbol for hydrogen peroxide is H_2O_2 . As is indi-

cated, it contains relatively twice as much oxygen as water and its molecular weight is $1 \times 2 + 16 \times 2$, or 34.

Calcium carbonate is composed of one atom or combining proportion each of cal-

SYMBOLS AND MOLECULAR WEIGHTS OF THE MORE COMMON CHEMICAL SUBSTANCES WITH WHICH LIME AND CEMENT MANUFACTURERS ARE FAMILIAR

Chemical Name	Common Name	Symbol	Molecular Weight
Aluminum oxide	Alumina	Al_2O_3	102
Calcium oxide	Lime	CaO	56
Calcium carbonate	Limestone	$CaCO_3$	100
Calcium fluoride	Fluorspar	CaF_2	78
Calcium hydrate	Hydrated or slaked lime	$Ca(OH)_2$	74
Calcium sulphate	Sulphate of lime	$CaSO_4$	136
Carbon monoxide		CO	28
Carbon dioxide	Carbonic acid gas	CO_2	44
Ferric oxide	Oxide of iron	Fe_2O_3	160
Ferrous oxide	Oxide of iron	FeO	72
Magnesium oxide	Magnesia	MgO	24
Magnesium carbonate	Magnesite	$MgCO_3$	58
Manganese dioxide	Black oxide of manganese	MnO_2	84
Potassium chloride	Muriate of potash	KCl	74.5
Potassium oxide	Potash	K_2O	39
Silicon dioxide	Silica	SiO_2	60
Sodium chloride	Common salt	$NaCl$	58
Sodium oxide	Soda	Na_2O	62
Sulphur trioxide	Sulphuric anhydride	SO_3	80
Sulphuric acid	Oil of vitriol	H_2SO_4	98

cium and carbon and three atoms or combining proportions of oxygen, hence its symbol is $CaCO_3$; and its molecular weight is as follows:

Calcium	40
Carbon	12
Oxygen	$16 \times 3 = 48$
100	

The symbol for hydrated lime, or calcium hydrate, as the chemist expresses it, is $Ca(OH)_2$. This is equivalent to $CaO \cdot H_2O$, and its molecular weight is;

Calcium	40
Oxygen	16
Hydrogen	1
17 \times 2 34	

Molecular weight.....74

If we wish to find the percentage composition of a compound we have only to multiply the atomic weight of each element by the number of atoms of that element

which make up the compound (as shown by its molecular symbol), multiply the product by 100 and divide by the molecular weight; the quotient is the percentage of that element in the compound. Thus, to

SYMBOLS AND MOLECULAR WEIGHTS OF THE MORE COMMON CHEMICAL SUBSTANCES WITH WHICH LIME AND CEMENT MANUFACTURERS ARE FAMILIAR

find the percentage composition of calcium oxide, multiply the atomic weight of calcium, or 40, by 100 and divide the product so obtained by the molecular weight of calcium oxide, or 56, the quotient, or 71.4, is the percentage of calcium in lime. Similarly to find the percentage of oxygen multiply the atomic weight of oxygen, or 16 by 100 and divide by 56, the quotient, or 28.6, is the percentage of oxygen.

Similarly to find the composition of calcium carbonate. (Symbol $CaCO_3$, and molecular weight 100.)

Calcium	40	$\times 100 \div 100 = 40$
Carbon	12	$\times 100 \div 100 = 12$
Oxygen	$16 \times 3 \times 100 \div 100 = 48$	

The table above gives the symbols and molecular weights of some of the more important chemical compounds with which the lime and cement manufacturer has to deal.

(To be continued)

Carbonation of Burnt Lime in Soils

ONE OF THE MOST THOROUGH investigations of the effects of burnt lime for agricultural purposes is that of Dr. Walter Hodge MacIntire, of the University of Tennessee Agricultural Experiment Station, Knoxville, Tenn. This is now available in booklet form, but is rather too complicated and technical a work to interest the average producer of agricultural lime and limestone. His conclusions of interest to producers are:

"(a) Lime (CaO) and hydrate ($Ca(OH)_2$) in 2 to 4-ton per acre applications will revert to the carbonate (lime-stone form) more rapidly when left on the soil surface than when mixed with a dry mulch or the moist soil.

"(b) If the oxide or hydrate of lime is left on the soil surface for several days prior to inworking, the treatment is in effect an application of finely di-

vided calcium carbonate (lime-stone).

"(c) Surface applications of oxide and hydrate will, for the most part, revert to the carbonate more rapidly during humid atmospheric conditions.

"(d) If the oxide or the hydrate is incorporated within the upper zone of the soil, prior to a more thorough dissemination throughout the soil, the concentration thus effected will bring about in the treated zone a temporary and partial sterilization which may have certain beneficial results.

"(e) The avidity, or affinity, of CaO (burnt lime) is for moisture, and when this is furnished by the aerial and soil atmospheres and by soil moisture, there is no tendency to effect any chemical disintegration of soil organic matter.

"(f) Neither CaO nor $Ca(OH)_2$, can be considered as chemically destructive of soil organic matter (humus) when used in the manner and in the amounts to be considered as practical applications."

Lime Hydration in the Sand-Lime Brick Industry*

Combination of Mechanical Hydration and Silo System Proves Best at Plant of the Saginaw Brick Co.

SLAKING LIME BY HAND has been a practice of the sand-lime brick industry since its beginning, and the hydrated lime when produced in this way is entirely satisfactory. But the labor expense and the difficulty of securing men for this work is so much of a problem that the necessity is felt, especially in the larger plants, for a mechanical system that will operate satisfactorily. Many arrangements have been devised and used with more or less success. Among the numerous systems tried out is the silo system, so called because the lime is stored and the hydration completed in a large bin or silo.

While not mechanical in all details it effects so large a saving in labor that its use marks a distinct advance in preparing lime for use in brick making. In this system the lime and water are mixed together in a bucket, some times of several hundred pounds capacity, and dumped into a bin or silo, tightly closed except to receive the lime through an opening at the top. When high calcium lime is put into the silo in large quantities, quickly, so as to conserve the heat, this method gives excellent results. It is advisable to leave the lime in the silo until nearly or entirely cold.

This system has been installed and successfully operated in many factories. A wet pan or some other type of grinding mixer for preparing the material for the press is necessary. One man by this method can maintain a maximum rate of unloading and slaking of about one ton per hour, but the task is dusty and disagreeable and not many men can be found who are willing to do this work, even at a premium over the other men's wages. However, I have never heard of a plant going back to the older method of preparing lime, after having used the silo system.

The method of storing all lime in silos, hydrated, so that no further handling is necessary, is economical and convenient and the most recent development is to place a simple hydrating machine on top of bins or silos, the machine doing what has been the most disagreeable part in handling the lime.

The machine is so placed that the crushed burned lime is automatically fed

By J. Morley Zander

Sec'y and Gen. Mgr., Saginaw Brick Co.,
Saginaw, Mich.

into it from a hopped bin and the hydrated lime discharged directly into the silo. As the machine will handle about two tons per hour the lime is prepared as fast as one man can shovel it out of the box car in which it is received. The lime goes into the silo uniformly hydrated and while still heating. It is important that it should continue to heat after getting into the silo if perfect hydration is to be secured. This heating accomplishes a result similar to that obtained by cooking the lime in buckets under the brick cars in the hardening cylinders, and the larger the mass in the silo the longer the heat will last and the more effective it will be.

Most silos are large enough so that when filled they will keep the lime hot several days. Many of them hold as much as 50 tons. Some installations of silos have been made in which the lime after hydration has commenced in the buckets or hydrating machines, is carried over the tops of several silos in open distributing conveyors. This method allows the lime to cool to such an extent before hydration is completed that only a very high calcium lime can be successfully treated in this manner. Comparisons and tests demonstrate that lime which is allowed to partially cool between the hydrator and silo, or lime that is put into the silo in a small quantity only and there allowed to cool, will make much poorer brick than the same lime will if handled in a large quantity and in such a way as to hold the heat long enough to thoroughly hydrate.

Silos should be filled as quickly as possible and it is here that the mechanical hydrator is effective as a car of lime can be unloaded and hydrated in from one to two days' working time. The hydrator is simple and easily understood by the labor usual to a sand-lime brick plant and there are no delicate or complicated adjustments to make. The energy consumption is not more than 10 h. p. for hydrating at full load, and the services of one man is all that is needed to shovel the lime onto the conveyor. Any

lime that can be successfully prepared by the silo method can be handled by the machine system and the better hydrate secured with less expense than by the hand-operated buckets.

The following result was secured at one factory equipped with a conveyor from the box car door, discharging into a vertical elevator and that into a storage bin above the hydrator. There was unloaded and hydrated on January 28 and 29 of this year 30 tons of crushed lime in 16 hours, and one man did all the work of unloading. No one attended the machine after it was started each morning by the foreman.

The hand hydration of lime has been a most serious problem and the above is a solution because the system works with a minimum of labor and that so placed that the work is not disagreeable, repairs are few, and there are no delicate adjustments or complicated mechanisms to worry the factory management.

Manufacturer Builds Recreation Hall for Employees

VAST SUMS of money are being spent by industrial enterprises for the welfare of their employees, but perhaps nowhere is there a concern doing more for its employees than the Goodyear Tire & Rubber Co. of Akron, Ohio, which now has 33,000 on its Akron pay roll.

Goodyear Hall, the new two and a half million dollar recreational institution and industrial university of the company, was formally dedicated on Saturday, April 17. It is said to be one of the most pretentious buildings ever erected by a concern solely for the welfare of its employees.

The principal feature of the new building is the establishment of Goodyear's Industrial University. With a faculty of 117 college professors, it already has an enrollment of 4,700. The university has 65 class rooms, four large laboratories and large assembly and lecture rooms. All forms of study are embraced in the curriculum from rudimentary grade school classes and Americanization classes for the foreign born to standardized collegiate post graduate courses for those desiring to round out incompletely college careers. The 600 classes, arranged to accommodate employees from all three daily eight-hour shifts, are open to bona fide employees without tuition charges.

*Paper read at convention of Sand-Lime Brick Association at Buffalo, N. Y., February, 1920

United States Gypsum Company's Ft. Dodge Plant

Mining, Grinding and Calcining Processes Used by Largest Manufacturer of Gypsum

THE UNITED GYPSUM CO., whose main offices are in Chicago, Ill., and whose field of operation includes seventeen widely distributed plants producing 5,500 tons of gypsum products daily, is by far the largest gypsum plant operator in the world. Through the courtesy of the company ROCK PRODUCTS is able to give to its readers the following description of its Ft. Dodge, Iowa, plant, which is one of the largest and most complete in the country.

The gypsum deposit of the Ft. Dodge district, according to the U. S. Geological Survey, is 70 sq. mi. in extent and is reputed to be the largest and richest in the world. The deposit lies from 50 to 70 ft. below the surface of the ground and is from 18 to 30 ft. thick. Because of the heavy crust of earth and the relatively thin layer of gypsum the only method used in removing the material is by underground mining.

The stratification and character of the deposit makes it particularly adaptable to such a method. Several mud seams indicate that the process of formation, which is of sedimentary origin, was interrupted. These seams greatly simplify the mining and are designated by the miners by their distance below the seam which forms the ceiling; thus there is a 9-ft. seam, a 15-ft. seam, a 16-ft. seam and one 18 in. below the 16-ft. seam. Gypsum is a soft rock in character and is easy to blast and crush.

Mining Methods

In opening the mine the 9-ft. seam is

followed for a ceiling and the 18-in. seam for a floor, thus making the elementary entries approximately 9 ft. high.

The drilling is done by two-man operated electric drills, which are set up close to the wall so that three holes may be drilled from each setup. A 1 1/2-in. hole is drilled about 8 ft. deep and either black powder or dynamite is used to dislocate the rock. Ordinarily, for solid stone the detonation of the black powder is fast enough, but for the loose stone better results are obtained by using dynamite and electric detonators and an electric current to discharge the blast.

As the entries are lengthened cross-cuts are made, which run at right angles to the entries. Rooms are opened off of the entries and the entire deposit is removed as far as it is safe; that is, the ceiling is raised to about 3 to 6 ft. from the top of the deposit and the floor is lowered to 3 to 4 ft. below the 18-in. seam.

In order to insure safety to the workers cross-cuts and rooms always have two passageways so that in event that one passage is filled by a cave of the ceiling there is another way to get out. Test holes are made by drilling vertically up through the ceiling, and at all times it is attempted to keep at least three feet of supporting rock. Owing to a variation in the thickness of the deposit, the ceiling and floor cannot be exactly the same level in all parts.

At present the property is very well opened up and the work of removing

and transporting the rock to the shaft is carried out very systematically.

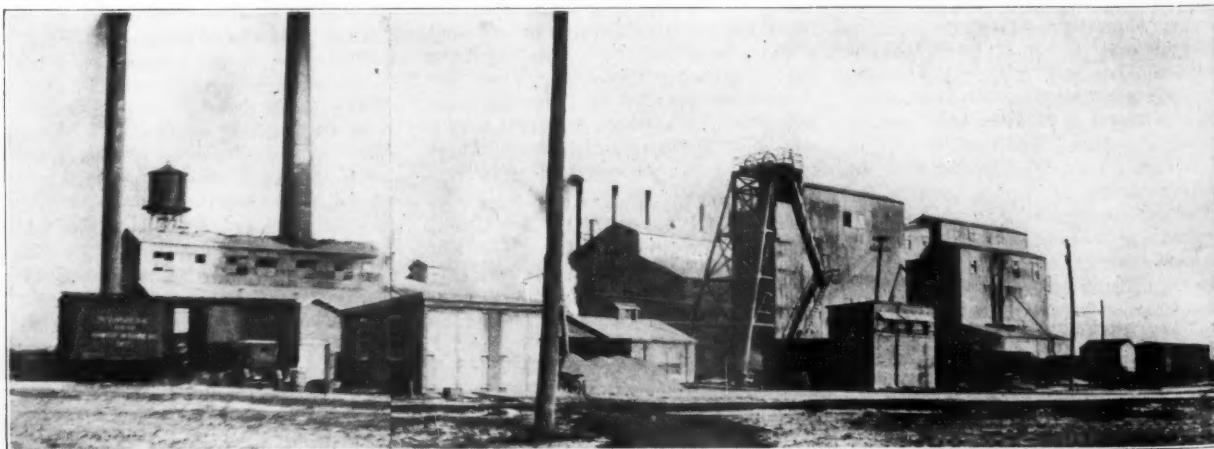
Narrow-gauge main line track is laid from the shaft out into the several districts of the mine, where a room is widened out to enable a switching center commonly termed a lye.

The material is hand loaded at the face into mine cars, which are pulled to the lyes by mules over temporary track. At the lye trains of about twenty cars are made up and electric locomotives draw them to the shaft. There are lyes in three different parts of the mine and the locomotive is so scheduled that it comes to one lye with a train of empty cars and takes away the loaded cars. While the empties are being loaded trips are made to the other two lyes and so each section of the mine is served continuously and the hoist is kept busy with cars from all parts of the mine. Current is supplied to the locomotives by a trolley line carrying 240 volts.

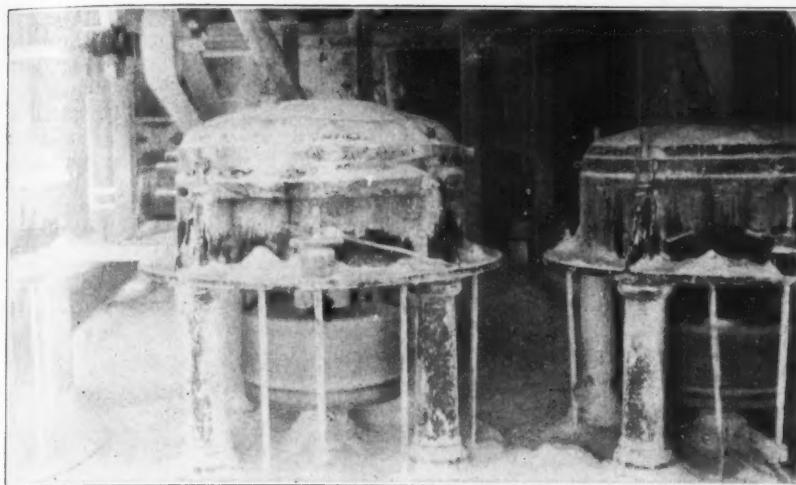
The mine cars are hoisted the 70 ft. to the surface by a steam hoist. The receiving station at the surface is immediately above the initial crushers. Before being emptied into the crushers the material is weighed and this weight and the number of the miner who did the loading is recorded upon a large sheet. In this way a complete record is kept and the miners are paid by the tonnage produced.

Crushing Plant

The mine cars are dumped into the weighing hoppers by automatic self-dumping cages. The rock is discharged



This plant, located at Ft. Dodge, Ia., is one of the United States Gypsum Co.'s largest



Burr mills used to pulverize the gypsum rock

from the weighing hoppers directly into the two crushers. The chutes are so arranged that the car on either cage can be dumped into either of the two crushers.

Owing to the soft character of the material handled an unusual type of crusher is used. It is called a rotary crusher and is very similar in appearance to a gyratory crusher, but has a coffee grinder instead of an eccentric action. That is, the spindle does not oscillate and does not have a crushing force, but because of the projections and grooves it has a grinding action. This is all that is needed to reduce the soft gypsum rock from one-man size to $1\frac{1}{2}$ in. Stone of this size is sent to a storage bin of 1,200 tons capacity.

Drying and Pulverizing

As required, the stone is withdrawn and dried in a battery of coke-burning driers. The driers are very similar to those used in the cement industry except

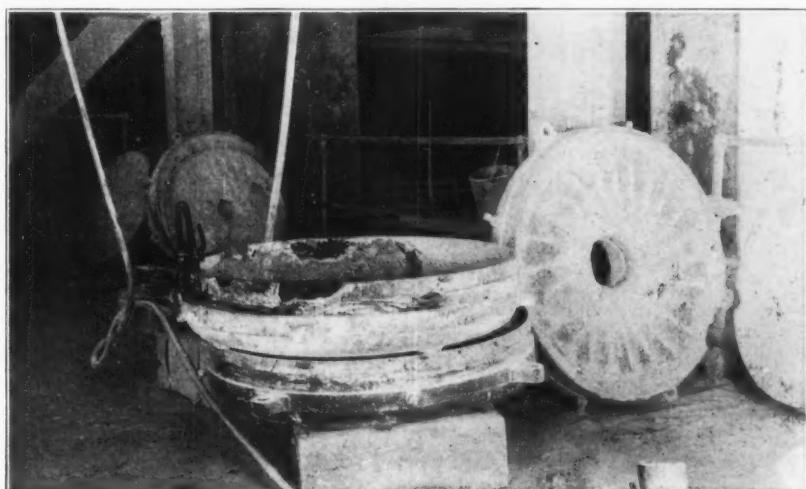
that the furnace is fed with coke instead of coal to keep the material free from

cinders and because the gases of coal would stain the gypsum. From the driers the material goes to two 300-ton pulverizing supply bins. The pulverizing, which is in two stages, is done by vertical burr mills consisting of two hard stones, one of which is stationary and the other revolves on top of the stationary stone. The grinding is done between the two stones. Radiating grooves are cut in the grinding surface of each stone and as they become smooth the stones must be roughened again. Extra stones are kept on hand so that no time will be lost during dressing.

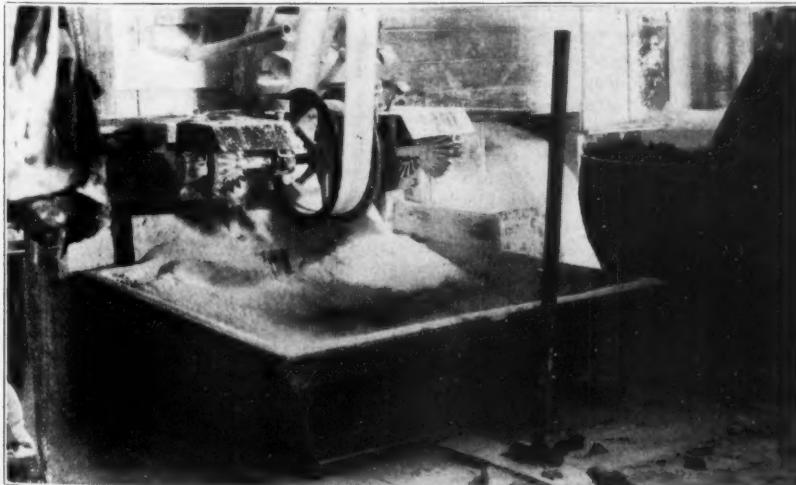
The material is fed into the center of the machine and from the top. As it works out between the surfaces of the stones it is reduced. The speed of the mill is about 500 r.p.m.

Calcination of Rock

From the storage bin the pulverized gypsum is fed into the calciners or kettles. This plant has six 15-ton kettles.



Head of burr mill, showing the radial grooves in the surfaces of the grinding stones



Mixing hopper where retarder and hair is added

A kettle is a hollow boiler plate cylinder of 10 ft. diameter and about 12 ft. deep. A casing around the kettle proper is supplied so that the heat from the furnace underneath may circulate about the outside. Several flues are provided in the bottom of the kettle so that considerable of the hot gases pass through these and increase the burning efficiency.

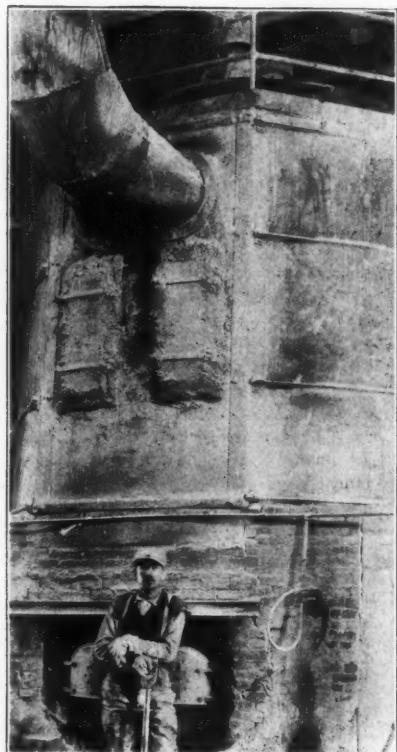
In order to prevent burning the gypsum is kept in constant motion by a large mechanical agitator. This consists of a gear-driven vertical shaft to which is attached a curved cross-arm bearing stirring paddles. The revolving agitator tends to move the gypsum toward the shaft. The agitator revolves at about 15 r.p.m.

It requires about 20 minutes to fill one of these kettles and from $2\frac{1}{2}$ to $3\frac{1}{2}$ hours to complete the calcining. The process which goes on in the kettle is

about as follows: The gypsum as it comes from the mine is of approximate formula (Ca SO₄ + 2H₂O).

When the powdered gypsum is heated with a rising temperature the water of crystallization is partly driven off. The steam evolved and the constant agitation cause the fine particles to float up and become disturbed much as though the mass were boiling. The heating continues till a temperature of some 330 degrees is recorded. At this stage the first settle ends; that is, about one-half of the water of crystallization has been removed. The loss from original volume is from 15 to 18 per cent.

In most cases the first-settle material is reground and screened for the commercial trade, but this plant is equipped and has sale for a finer product which is called second-settle gypsum or stucco. And so some of the kettles are not emptied at this stage, but the heating is continued until a temperature of about



View of kettle from firing floor

400 degrees F. is obtained. The material apparently begins to boil, and at the end of another hour the second-settle material is finished. At this stage the dehydration has continued till the formula of the ideal material would be Ca SO₄ + 1/2 H₂O. The total loss in volume is 20 per cent. Second-settle stucco or plaster of Paris is used for finer work than first-settle gypsum.

Storage of Calcined Material

After the material has been dehydrated to the desired point the finished product is discharged into the hot bins, where it is cooled and awaits the final grinding. The final grinding, which is also done in burr mills, reduces the product to about 90 per cent through 100-mesh. Finer and special products are reduced even smaller.

The fineness is governed by a set of Newaygo screens which rejects oversize back to the mill to be reground. The product passing through the screen is conveyed to a storage bin of 1,800 tons capacity by a screw conveyor. This bin is what might be considered the third floor of the packing house.

Pure plaster of Paris when pulverized to 80 or 90 per cent through 100-mesh will set when water is added in six to ten minutes, and so it is necessary to add a retarder and also a fiber. In this plant the retarder is an organic material and the fiber is cattle or goat hair.

Plaster Mixing

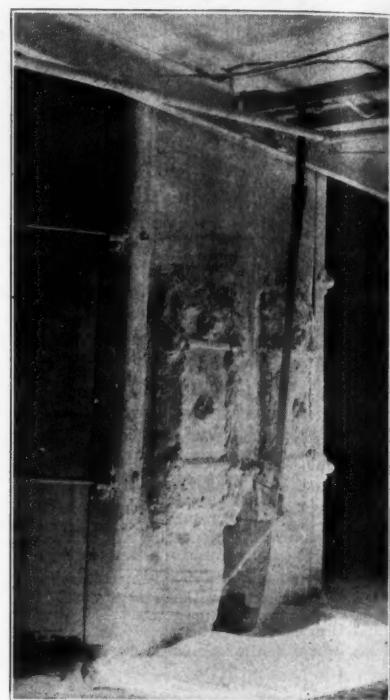
Immediately beneath the storage bin is a mixing hopper into which a weighed amount of stucco is run by gravity and here the retarder and hair is added. It is stated that the quantity of retarder varies with the winter and summer seasons but averages between six and nine pounds per ton. About four pounds of hair (fiber) per ton is also added. Hair is brought to the plant in tight bales and must be picked or divided before being added. The hair picker consists of a round disk about 16 in. in diameter mounted on a shaft at the center and rotated at a high speed by a small motor. When a piece of hair is dropped into the machine it is caught by teeth on the disk and shredded and thrown into a hair bin.

Sometimes wood fiber is added to the plaster of Paris as a filler for mortar to be used in the building industry. A department is used for the manufacture of wood fiber. Wood fiber machines are of two types. One type is very similar to a lathe and a short section of a basswood log is mounted between centers and rotated. Saws attack the surface and shred the wood to furnish the filler. In another type the log sections are mounted on a flat horizontal revolving bed and as the bed revolves it brings the logs under saws, which also shred the wood. In this type a number of wood sections may be attached and the amount of fiber made in between set-ups is much greater. A fan causing an induced draft above the saws blows the particles through metal tubes to the wood fiber bin.

Various Market Forms of Gypsum

Gypsum has a number of uses and so is prepared in a number of stages. The first stage being for the cement manufacturer. In preparing "gravel" for

cement manufacturers the process is stopped after the driers; that is, cement gypsum is merely dried crushed gypsum. Land plaster used for agricultural purposes also does not require calcining, but is sold at this point. First-settle gypsum is used for building purposes, etc. The second-settle material is for finer work, including plate glass plaster, pottery plaster, molding plaster and plaster for dentistry and surgery.



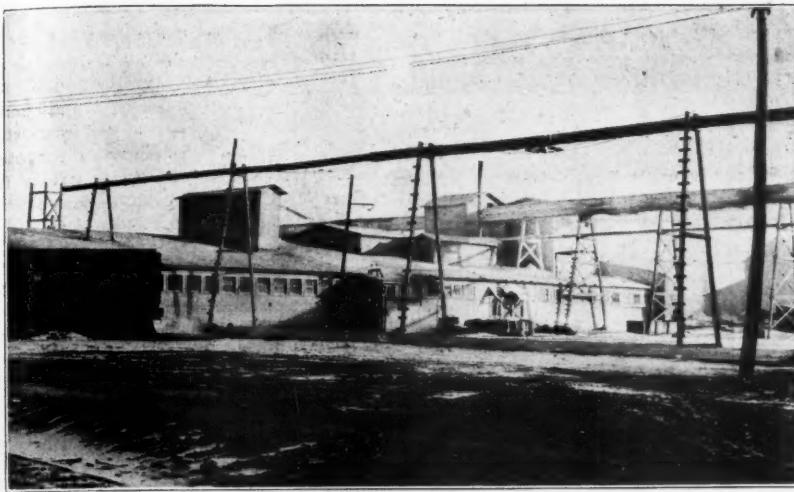
View of kettle showing discharge

A large use of stucco is for "Sackett board," "Sheet Rock board" and "Pryobar" roofing tile and floor tile and "Pryobar" partition tile, which are manufactured on the company's property of the Ft. Dodge plant. A large building is devoted to the manufacture of each. These products are manufactured in the following method:

Block-Making Plant

The stucco is delivered to the block plant in the bulk form and is stored in a bin which feeds by gravity to a belt mixing machine. The belt mixer consists of a short, endless belt such that the dry material is fed onto one end and as it moves slowly along water is sprayed upon it and it is mixed by small revolving paddle wheels. The lower end deposits the material into either a patented automatic block machine or a hand molding machine.

The automatic block machine is an endless chain, each link of which is a form for a block. The forms are filled with the mortar as they pass under the



View of block-making plant

mixer and as they move along the surface is leveled off and they are marked and stamped.

By the time a form has moved from the mixer to the end of the machine the mortar has set sufficiently to be removed as it loosens at the turn. The blocks or tile are removed at this time and put upon a kiln car.

When the kiln car has been loaded it is run into a long horizontal kiln, where the blocks are dried for 48 hours. At the end of that time the blocks are removed from the storage end as hard white tile or blocks and are either shipped out or put on a reserve stock pile.

The hand-molding machines are used for making large sized tile. The material is mixed by the belt mixer and is fed into the forms. In this case the forms are mounted on a cylindrical bed plate which revolves about a center.

The finished product is removed after the form has been partly collapsed and the large tiles are swung to the kiln cars by a traveling chain falls. About two of these tiles are put on a car and they are

cured and dried in the manner described above.

Wall-Board Plant

In the wall-board plant the mortar is mixed in the same way as in the block plant. Wall-board is a series of layers of paper and mortar. Rolls of paper are so mounted that one ply of paper unrolls upon a long belt conveyor before the mixing machine and the mortar is applied on top of the paper. A second roll of paper drops a second ply on top of the mortar and as the belt moves along the board is pressed out under the roll, the edge is turned under and an automatic cutting machine shears the board into desired lengths. This belt upon which the wall-board rides is several hundred feet long and by the time the end is reached the mortar is set and it is put into a kiln room similar to that in the block plant. The feed of the mortar to the belt is so regulated that in the case where two plies of paper are used the thickness is $5/16$ or $3/8$ in., and so when the roll presses it out the board is just filled and no more. This two-ply product is called "Sheet Rock" and when

cut into convenient sizes is sold to the building trade.

"Sacket Plaster" board differs from the preceding board in that it is $1/4$ to $3/8$ in. thick and that it consists of four plies of paper with layers of plaster in between each. The process in manufacturing it is quite similar to that used for "Sheet Rock" except that instead of one mixer and roller there are three of each, so that a layer of paper then mortar, then paper and mortar and paper is applied one on top of the other. Sacket board is a fireproof lathing material for use in buildings and plaster must be applied to it to make a finished wall. Sheet rock wall-board takes the place of both the lath and the wall plaster. The machines and belt conveyors are capable of being altered so that the size of the finished product may be changed to meet all of the standard widths and lengths used in building construction.

The officers of the United States Gypsum Co. are: S. L. Avery, president; S. Q. Fulton, vice president and treasurer; O. M. Knodle, vice president; S. T. Meservey, secretary; R. G. Bear, general sales manager; J. H. Nold, manager of operations; C. R. Birdsey, chief engineer, and Frank Griffith, works manager of the Ft. Dodge plant.

Indiana Reported a Big Producer of Cement and Cut Stone

THE STATE GEOLOGIST OF INDIANA, in a recent report, announces that Indiana ranks second in cement production. Only one-third of this is consumed within the state. Portland cement is the principal kind manufactured; however, a small amount of natural cement is also manufactured. There are five active cement plants in the state, situated at Bedford, Stroh, Syracuse, and Mitchell. One is now under construction at Limerdale. With the present capacity the production of cement in Indiana should exceed 10,000,000 bbls. during 1920.

Lawrence and Monroe counties contain 36 large quarries of Bedford oolitic limestone. More than 70 per cent of all the limestone used in the United States for building purposes is quarried and sawed here. Fifty-five large mills prepare this stone for the market; handling more than 10,000,000 cu. ft. a year. A recent order received by these mills includes enough dressed stone to fill 700 cars. The value of this stone is about \$1,000,000 and it will all be used in one building. This industry is now completely paralyzed by the railroad strike.

Quick and hydrated lime is manufactured in Indiana in amounts exceeding 100,000 tons a year.

The production of sand exceeds 3,500,000 tons a year, and gravel, 2,500,000 tons per year.



Yard storage of finished product with wall-board plant in rear

Southern Illinois Stone Producer Has Big Business Prospects

The Charles Stone Company Has Good Location for Sale of Both Road Material and Agricultural Limestone

SITUATED in the southern central part of Illinois at Joppa Junction, the Charles Stone Co. will be able to reap a harvest of business from the large state road building program and the sale of agricultural limestone. Southern Illinois does not have a great many mineral aggregate deposits of any kind, but there is a very large one here at Joppa, which will be of great service in Illinois highway development. The quarry face is 110 ft. at its highest point and is about 800 ft. long. The deposit is a hillside outcrop, which is easily worked with the exceptions of one or two sections where dirt pockets have been encountered. But since the quarry stone is hand loaded, the dirt may be removed without getting impurities into the commercial product.

The 110-ft. face is worked in one bench. A gasoline-engine driven well drill is used to drill the holes, which are started $5\frac{1}{2}$ in. at the top and tapered to 5 in. at the bottom. The holes progress at the rate of about 3 ft. per hour. These are spaced 15 ft. center to center and after some experimenting it has been found that better blasting results are obtained by discharging a single row of holes at a time. Four-inch sticks of dynamite are used—the charge being broken; that is, most of the dynamite is put at the bottom of the hole, but a small charge is spotted near the middle to break the top of the ledge. As many as 27 holes have been set off at a shot—detonators and an electric current being the favorite method. It is stated that on an average, 1 pound of powder will dislodge 4 tons of rock.

After the stone is shot down it is hand loaded into small steel end-dump cars. The view of the crushing plant and part of the quarry shows the net-

work of tracks which run out to the face for this purpose. When a clay pocket is encountered the dirty rock is loaded and hauled to a dump. It is found that the deeper the quarry is lowered the cleaner and freer from dirt pockets the deposit becomes.

Because of this fact it is planned to work downward instead of extending the property. The face is being lowered in 10-ft. benches. Up to the present time the quarrying has been a hillside operation, but now the quarry floor is on a level with the floor of the plant and so in the future a different method will be used to lower the quarry floor.

For this work the large stiff-legged derrick shown in the view has been constructed near the crushing plant. To lower the working floor, the stone is broken up to a depth of 10 ft. and is removed by skips of $2\frac{1}{2}$ cu. yd. capacity. These are hand loaded and are moved to the crusher hopper by the derrick.

To enable dumping at the crusher the skip is built with three sides boarded, and while being moved to the crusher platform it is suspended by a chain from each of the four corners. While resting on the crusher platform the two chains at the discharge end are loosened and by raising the rear end the contents are dumped into the crusher opening.

The quarry cars are drawn up an incline to the crusher and are end dumped into a No. $7\frac{1}{2}$ gyratory crusher. The product of this crusher is elevated to a scalping screen where all over $2\frac{1}{2}$ in. is rejected and chuted to a No. 5 gyratory crusher. This stone is sent to the sizing screen where the commercial stone is classified in sizes ranging from $2\frac{1}{2}$ in. to $\frac{1}{4}$ in. A hammer mill is used for the production of agricultural limestone.

Owing to the character of the rock, its

high calcium carbonate content and the big demand for agricultural limestone in southern Illinois, this plant produces a great deal of this material. It is stated that there is not a marked seasonal demand in this section of the country for the farmers have built bins for the product and so its sale goes on almost the entire operating season.

The plant is driven as a unit from one 150-h.p. steam engine. The engine and a steam-driven air compressor are supplied with steam from a 100-h.p. and a 250-h.p. return flue boilers.

The Charles Stone Co. has a daily capacity of 1000 tons. The main offices are at Marion, Ill. W. S. Charles is president and treasurer; R. E. Howland is the superintendent.

Necessity of Good Roads Is Emphasized by Railroad Freight Crises

EVERYBODY should get behind the 'Ship By Truck' movement," says Harry Branstetter, local Kissel distributor.

"The present railroad freight crisis emphasizes this necessity and shows clearly that the nation's transportation requirements make good roads necessary.

"We should not leave this movement up to any one class of business men. It is a movement that demands co-operation of not only motor truck makers, distributors and dealers, but of motor truck owners and drivers. We should all realize that motor truck transportation has been proven an efficient method of hauling.

"By every community, every county, every state, co-operating in the matter of building more good roads and improved highways, it will form an endless chain of economical transportation, an invaluable addition to the resources of the country."



Plant of the Charles Stone Co., Joppa Junction, Illinois

Solve Your Personnel Problems

Human Side of Business Now Being Recognized as Most Important Element in Success

WHEN EARNINGS OR PRODUCTION FALL below normal, executives naturally begin to give their best thought to locating the trouble. Perhaps they decide that the machinery or equipment is out of date. So they proceed to buy new machinery or new equipment, sometimes at heavy cost. Or perhaps they think their methods need revising, and bring in an industrial engineer or an efficiency expert to make over their way of doing things.

Sometimes they decide that a cost system is needed or that their existing system is wrong or inadequate, and an expert cost-accountant is put on the job.

It is with no lack of faith in the efficacy of these remedies that I say that in many instances it is not machinery, or organization, or cost system that needs attention. Very often the trouble is not material; it is human. It is not things, but people.

Now, in a purely industrial concern trouble of a personnel nature is much more likely to be located than in a commercial business. Labor has a way, as we all know, of making itself heard and felt. As a matter of fact, the present labor unrest can be attributed largely to the fact that in the past employers were blind to personnel problems. They ignored personnel principles. They failed to recognize that all their problems revolved around the man problem, and that not until their attitude toward their workers was the essence of fairness, honesty and square dealing could they expect to run along smoothly and efficiently.

Human Side of Business Neglected

For many years industrial executives devoted their time and attention to the mechanics of their business. Decreasing costs and speeding up production were to be brought about by mechanical means.

A few manufacturers did realize that the human side was the important thing, and took steps to offset the possibility of troublesome labor disagreements. But for the most part they merely dabbled and piddled with the thing. Some of them made great splurges in "welfare work." They thought the proper thing was to do things for their employes, to hand them what amounted to presents. Without question many such efforts did more harm than good—though perhaps for the most part well-meant.

The truth of the matter is, honest, self-respecting men, no matter how poor or how lowly, do not want to have things done for them. It rouses their ire and distrust. What they want is a decent opportunity to do things for themselves. They want

By William Marvin Jackson
Director, Personnel Development Service
of "Forbes" Magazine

good treatment—yes; but they want it as a right and not as a gift nor as a concession. They want fair wages, but not too much of it in the form of bonuses.

An Accounting of Personnel

The ordinary business executive today is still seeking to solve his problems by mechanics. That is, when something is at fault he thinks about organization, about equipment, about methods and machinery. He hesitates little about spending a few thousand dollars on reorganization.

Too few business executives think of having someone come in to bolster up the morale, to raise the tone, to inspire the workers to put forth better efforts, to point out the opportunities ahead and show them how they can grasp these opportunities.

And many employers would be somewhat skeptical about the value of giving the employes definite training to increase their efficiency in the present work and prepare them for the work ahead.

The biggest asset that any business can have is not cash on hand or in the bank, or bills receivable, or machinery and equipment, or good will. It is the working force—the workers. They are the biggest, the most important asset of all.

When a business is sold or appraised how often is the worth or value of the workers taken into consideration? Some of them have probably grown up in the business. Many have had years of experience. They have a knowledge of the business and an experience which represent a high money value, knowledge and experience without which the business could not be run. Stop and try to figure out how much it would cost to employ and train for efficient work an entirely new force in a business of any size and you will begin to appreciate the actual money value of the working force itself.

This value, this potentiality, I would call for want of a better name, personnel goodwill. It is an inherent worth, valuable in proportion to the number of employes, the experience and training necessary for most of the positions, and the "spirit" displayed.

Employers who have really given serious thought to this matter of personnel relations have realized the necessity of approaching the question in a big, broad-minded, whole-hearted way. They recog-

nize the harmfulness, the futility, of nibbling at it here and there in a small way. With them the human side ceases to be a plaything—something to think about when nothing else is pressing. It looms large as the heart, the soul of the business organism.

Incentives Needed to Retain Employees

Training and education are regarded as an investment rather than a needless expense.

Adequate plans for fostering a fine spirit, for placing salaries on a proper basis, for giving proper recognition to increased worth, for supplying real incentives, are regarded as absolutely essential to progress.

No business can expect to retain its employes if it does not supply real incentives. Every employe worth having is looking ahead. He wants to grow, to make reasonable progress. Supplying incentives does not necessarily mean making the way easy. It merely supplies motives, reasons why employes should do their best. No intelligent person can do his best without an ever-present incentive. The person who will work hard year in and year out without feeling that there is something ahead worth working for is either utterly lacking in ambition or in common sense.

Some incentives might be termed "immediate." They are: good working conditions, an appreciative employer, agreeable fellow-workers, aptitude for the particular work engaged in, the feeling that the employer endeavors always to do the square thing by his employes, real opportunity to learn the business, knowledge that those in authority have a means of keeping in touch with one's work, an employes' club, and, in the case of large institutions, an employes' publication of some kind.

Other incentives are "prospective." For example, the possibility of an increase in salary in a reasonable length of time; the possibility of a promotion when one is qualified and when the opportunity presents itself; the knowledge that periodically an accurate report of one's record in work, desire for self-improvement, etc., will be made out and brought to the attention of an officer or executive.

The third class of incentives might be classed as "remote"—knowing that there are positions at the top worth working for, and the understanding that men from the ranks will be selected for these positions if they can qualify.

It is the business of every employer to see to it that definite incentives are provided. Without them, employes cannot be

expected to be loyal, energetic and efficient. The personnel problem in growing institutions is particularly difficult, for as the size of an institution increases the morale of the workers decreases. Some of the reasons are: the scope of each job becomes smaller, increasing its routine nature; the employe's "outlook" is restricted—he knows less of what is going on; he begins to feel like a part of a big machine; the workers have less contact with officials and those in authority. This contact is a thing they prize highly. One word from an official is worth a hundred from some one with only minor authority. In many institutions the employes have the feeling that their efforts are hidden, that those who have the power to promote or increase salaries do not know whether they are doing good work or not. This feeling creates dissatisfaction and oftentimes an inclination to "take things easy."

The Interview Plan

To meet this situation a number of concerns have adopted what is called the interview plan.

Briefly stated, this plan provides for interviews between the employes and important officers or executives at periodical intervals. Under this plan employes receive increases when they deserve them and not once a year or every six months. They have an opportunity to voice their grievances before an officer at any time desired. Employes doing good work or those poorly equipped for a particular job are not allowed to continue in the job indefinitely. Something is done about it—something constructive and helpful, from the standpoint of both the employe and the business.

This interview usually takes the form of a good heart-to-heart talk between the officer and the employe. The executive is able to get a real picture of the employe's record, of his spirit, his fitness for his work, his efforts to improve himself. He finds out whether the employe is pleased with his work and with his prospects. The employe is invited to "open up" and tell what is on his mind, to make any complaint or voice any grievance which he may have in the back of his head.

Making Employees Contented

The objection might be raised that the time of officers or other executives is too valuable to spend on a matter of this kind. My judgment is that interviews such as I have described constitute as important and as valuable work as any officer could possibly do. The saver is a producer. And that this plan saves money in materially reducing turnover and in increasing the spirit and all-round efficiency of the workers has been demonstrated beyond question.

The strength of a business is directly proportional to the performing ability of its employes. And its possibilities for growth may be measured by the latent

ability of the workers. Under normal conditions a business does not grow automatically and pull the employes forward. The employes grow and pull the business along with them. Of course, the ability and methods of the executive must be taken into account, but no one-man business (a business in which one or two men try to carry the whole load) can grow healthily and permanently.

The wise employer is one who realizes these basic facts and through one means or another makes definite provision for supplying every possible incentive to his work-

ers, for the development of a real spirit, and for the constant training and education of his employes.

It is very well to have a proper regard for equipment, mechanical efficiency and good organization, but if an employer would go to the heart of the matter he would make sure that his employes are happy and contented, are growing in knowledge and usefulness, and are bringing increased interest and skill to bear upon their daily work. When he has made sure of these things most of the other problems will very largely take care of themselves.

(Copyright Forbes Pub. Co.)

Tests on Concrete Aggregate by Bureau of Standards

WASHINGTON, D. C.—Experiments to determine the effect upon the strength and permeability of concrete of curing it for different periods of time in solutions of magnesium fluosilicate and sodium silicate have been completed at the Bureau of Standards. These tests, although of a preliminary nature and limited in extent, appear to indicate that rich concrete mixtures may be improved in strength by curing for certain periods in magnesium fluosilicate, but are not made less permeable. Both 1:1:2 and 1:2:4 proportions were improved in strength and made slightly less absorptive by curing in sodium silicate solutions.

Physical Properties of Granite and Indiana Limestone

An investigation of the properties of the commercial granites of the United States has been commenced. Certain tests have been made on 12 varieties that are in extensive use in the eastern portion of the country.

A summary of the tests on 72 samples of Indiana limestone has been completed and is available for all those interested.

This summary gives the compressive strength, transverse strength, absorption value, porosity, and weight per cu. ft. for each of the samples tested.

Concrete for Oil Tanks

During the past month, nine additional tanks have been put under test in which are stored oils ranging in specific gravity from .948 to .809. These tanks are made of 1:1½:3 mixture of concrete. Tanks Nos. 1 and 3, in which are stored a fuel oil with a specific gravity of .854, show that some oil has penetrated the concrete. Tanks Nos. 2 and 4 show no sign of the penetration of oil to the outside surface. These tanks have been under test approximately 75 days.

Concrete for Water Tanks

The test of concrete tanks made of 1:2:4 mixture and used for water storage has been discontinued after 150 days because the day-loss curves have taken the form of a straight line showing that the daily loss

has become constant. It would seem from this that although the head of water amounted to 35 ft. the 1:2:4 concrete is sufficiently waterproof for this purpose.

Oversanded Concrete Shows Greatest Strength at Twenty-Eight Days

In commercial work, it has been found that concrete foremen will decrease the ratio of sand to gravel so as to produce a better working concrete, and preliminary work has been started in the laboratory to determine the effect of "over-sanding" 1:2:4 and 1:3:6 mixes. Very often with the very best of material these standard mixes will produce harsh, segregating, unworkable mixes. This is particularly true when crushed slag or crushed stone are used as coarse aggregate.

A crushed limestone was submitted for test in 1:2:4 concrete with river sand as the fine aggregate. This mix was made, but was found to be harsh and segregating. A 1:3:3 mix of the same materials was found to be much more workable when made so as to have the same consistency. Strengths were found to be higher for the over-sanded mix at an age of 28 days, and it was also found that contrary to the general belief less cement was used in the over-sanded mix.

Substitute for Jute Burlap in Sandbags

IN CONNECTION with the investigation of a substitute for jute burlap used in sandbags for the War Department, samples of four kinds of paper, one grade of cotton fabric and one grade of burlap have been exposed to the weather on the roof of one of the bureau's buildings and will be tested at stated intervals to determine the effect of rain and sunshine on the strength of the material.

Preliminary tests are being made to determine the result of dropping a bag filled with sand or dirt under regulated conditions. The bag is dropped from definite heights in different positions in order to test the seams, the tying and the strength of the material.—Commerce Report.



Commercial Explosives—IV

(Prepared by the Engineering Department of the National Safety Council)

Low explosives are ignited by a flame introduced by means of a squib, fuse or electric squib, or by the detonation of Cordeau-Bickford. In using fuse it is well to hold upright and cut off with a sharp knife the first inch or two of fuse just before use. This is done to make sure that it is dry and in good condition. No doubt the safest way to fire a charge of black powder is by means of an electric squib.

When flame is applied to high explosives they may burn instead of explode. The way to detonate them most surely and completely is by means of a cap and fuse, electric cap, delay cap or Cordeau-Bickford. All explosive manufacturers have advised against the use of caps weaker than No. 6 strength, and they have recently decided not to make weaker caps.

Inserting Fuse Into Cap

In inserting the fuse into a cap, the fuse should be held upright and pushed in until it just touches the surface of the detonating material and is then crimped tightly in place in the capsule. Crimping should never be done by the teeth or anything but a pair of crimping pliers. Probably the best type of crimper is the flat sleeve type which contracts the top of the detonator uniformly and forms a groove one-eighth in. wide around the copper shell. This seals the detonator so it can be submerged in water for at least thirty minutes without destroying its efficiency. A thin film of tallow or special compound around the end of the fuse is a further insurance against water spoiling the detonator.

Inserting Cap

There are many opinions concerning the way a cap should be inserted into a cartridge. It is agreed, however, that the whole of the detonator proper should be surrounded by the explosive. Otherwise the detonation may be incomplete or imperfect. For punching holes in cartridges for the insertion of the cap the safest instrument is a sharp hardwood skewer. A common way to insert the cap in the cartridge is through a hole in the end. Some miners, however, prefer

to make an inclined hole in the side of the cartridge, in which case the fuse (or wires) is tied to the cartridge in two places.

Firing by Electricity Is Safest

Firing by electricity is safer, quicker, more efficient, more certain and cheaper than any other means for setting off blasts. When there is explosive gas or dust in the air electrical firing only should be employed. In connecting electric wires to the legs of an electric detonator the insulation on each should be scraped off bright and clean for about 2 in. from the end. Then the wires should not merely be looped, but actually twisted together with at least five turns. These electric connections should not be made, however, until the hole has been charged and everything is ready for firing. A good plan is to wrap the wire connections with friction tape to insulate them and thus prevent the bare wires from coming in contact with each other.

The electric current for electrically firing shots may be obtained from:

- (a) Dry-cell or storage battery.
- (b) Power or lighting circuit.
- (c) Special hand-operated generator.

Accidental contact of wires with the poles of dry-cell batteries has been the cause of many premature explosions and as a result a safety contact device has been devised. This provides that after the wires have been connected the circuit can be completed only by the simultaneous pressure of both thumbs on the contact points. It is recommended that no batteries or cells be used unless equipped with this safety contact device.

Precaution in Firing With Electricity

Shots should never be fired by connecting onto the bare wires of an electric light or power circuit. If this direct source of current is to be used, special wires known as the firing circuit and special double pole switches should be installed and other precautions observed as listed by the Bureau of Mines.

Special hand-operated generators and firing machines are the best and safest sources of electric current. They vary somewhat in construction and operation, but the type commonly used in this country is the well-known "push-down" blasting machine. This contains a coil-wound

armature which is made to rotate between the poles of an electromagnet by means of a vertical geared ratchet. In use the current is stored until just as the down stroke is ended, the collected current is discharged instantaneously. The faster the ratchet is pushed down the stronger is the current. These machines are built in different sizes and are rated as four-hole machines, six-hole machines, one hundred-hole machines, etc., according to their firing capacity.

For firing more than one shot at a time holes should be connected in parallel when using dry batteries or a storage battery, but in series when using a blasting machine. When firing from a power or lighting circuit it is usual to connect in parallel or in "series parallel," depending on the voltage employed. Ample allowance should be made for the drop in voltage due to the heavy (though instantaneous) current passing through the exploders. Insufficient voltage will cause misfires.

(To be continued.)

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Random Comments on the Issues of the Day

There has always been a tendency on the part of many agricultural lime and limestone producers to condemn the farm "pulver" as absolutely without merit. True, the competition of the farm pulverizer is often very disagreeable and seemingly un-

Agricultural Limestone justified, but a liberal viewpoint considers the farm pulver as a means to the end in increasing the use of agricultural limestone—a temporary inconvenience, but an ultimate help to the industry.

The article in *Rock Products*, April 10, p. 41, by Clarke A. Richards, county farm agent at North Vernon, Ind., certainly substantiates the liberal point of view. This man created a very large demand for agricultural limestone by encouraging the farmers to pulverize it themselves. Like every other intelligent man who analyzes the case he eventually came to the decision that it wasn't the farmers' job to pulverize the stone—that the man who makes it a specialty could not only do it better, but cheaper.

So while for three years his work was a thorn in the side of the legitimate producer of agricultural limestone it has eventually been the means of building up the demand for a considerable quantity of the material within a very short space of time. Both the farmer and the agricultural limestone producer has been benefited.

The same holds true in some degree in the case of state reformatory competition with the legitimate producer. Both means of supplying the farmer with the material have their bad features in cheapening the product in his eyes, but both have a positive beneficial effect in introducing agricultural limestone.

There is no question but that ultimately the demand for agricultural lime and limestone will be so enormous that the farm pulver and the state prison product will be utterly insignificant. Nevertheless, it takes something of an altruist to do all his business on expectations of future profits; and it must be confessed that many agricultural limestone producers have had to derive their satisfaction from a knowledge of their contribution to the nation's welfare rather than in cash profits.

Riotous Prosperity Rock products producers throughout the country seem to be getting some small share of the general business prosperity. There seems to be an abundance of orders, but the disinclination of the average working man to do any more work than he can help seems to make the filling of these orders difficult. The car shortage situation is not showing the improvement expected. An immense tonnage of 1919 wheat and other grains remain to be moved, and the railway switchmen's strikes all over the country have made a bad situation very much worse.

Yet in spite of all these setbacks almost every city shows evidences of prosperity. The housing shortage is practically universal. Hotels are full of permanent roomers who cannot find places to live. Everybody seems to have plenty of money, but no large proportion of them are buying or building homes.

As an investment an automobile, under present conditions, appears to be many times more popular than a house and home. Take Denver, Colo., as an example. The housing shortage here is acute in the extreme, yet the following very significant analysis of the building permits shows the tendency of the times:

Approximately \$260,580 in building permits was totaled in the building inspection department yesterday for the first half of the month of April. Garages are greater in number than any other form of building construction, according to the figures which show 63 garage to only 20 residence building permits. Some of the garages are being built at an expenditure as high as \$10,000.

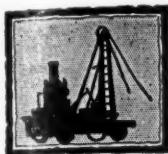
Of course, every thinking man is beginning to ask when and how will all this end, and what will the future hold for his particular business?

It will depend on who has all the money when this period of riotous spending is past. If the working man comes to his senses before it is too late and invests his surplus in real estate and a home we may get by without a serious panic. But if he insists on handing it out for extravagant things he will only be increasing the wealth of the bankers and capitalists. If this happens the outlook for small private home building will not be bright, but the outlook for much needed railway improvements and public works improvements will be good, for there will be a market for good, safe securities like railroad and municipal bonds, and labor conditions will probably be much more favorable to undertaking larger projects than they are now.

Producers of cement, lime, crushed-stone, sand, gravel and other similar construction materials have little to fear from any slump in general business, because such a slump will surely usher in a period of railroad and public works construction.

Assuming that there are approximately 250,000 miles of railway in this country, and figuring 3,000 tons of ballast per mile, it requires 750,000,000 **Railway Ballast** tons to meet the ultimate demand. If all this ballasting is done in the next 20 years it means an annual demand of 37,500,000 tons. The maintenance of tracks already ballasted requires about a ton per mile of fresh material per year, or its equivalent after a period of years. Consequently, the normal demand for railway ballast, if no new lines are built, should be in the neighborhood of 50,000,000 tons per year.

The preceding statement ought to be sufficient argument for a very active interest on the part of mineral aggregate producers in the prosperity of the railroads.



NEW MACHINERY EQUIPMENT



New Closed Type Vibrating Screen

THE ACCOMPANYING illustration shows the "Bucking Broncho" Screen, style B-B, which is manufactured by the Sturtevant Mill Co., Harrison Square, Boston, Mass.

The company claims that this particular screen is a simple, durable screen built upon principles never before used in the manufacturing of vibrating screens and that it has proved a remarkable success. This new principle of structure enables it to combine the action of all other screens, with many additional slaps, kicks and jars of its own. For this reason it has been dubbed the "Bucking Broncho."

Because of the rapid and continuous action of the screening cloth there is little or no trouble of the material being screened sticking in the meshes and clogging them up. Its range of output is from $\frac{1}{2}$ in. to 100-mesh and the capacity is dependent upon the fineness of the product desired.

It consists of a tight steel screen box fitted with conveyor-feed, chute-feed, or with spout feed-box only, as desired. It has an unobstructed "Open Door," which is practically dustless when closed, and when open gives immediate access to every inside part of the machine. The screen frame is secured to a "saddle," said "saddle" being covered by a coarse foundation wire (2-inch mesh), which constantly slaps the fine wire cloth resting upon it. The saddle-channels enclose and protect from dirt the "bucking" or kicking cams, which act upon them, transmitting violent shakes to the coarse foundation wire and to the finer screen clothing, which forms a unit, so hung that it has a vigorous up and down, side to side, back and forth motion, besides innumerable kicks, jars and vibrations which keep the meshes of the fine screen open.

Its screening surface is not stretched, yet it cannot sag, even if one stands upon it, because it is held up by the coarse foundation wires, resting on the saddle. There are no obstructions on screen, nor cover, and the Bucking Broncho operates equally well with cover open or closed.

Screens may be changed in a very few minutes.

A vibrated scalper or protective coarse screen, to save unnecessary wear on the finer meshes, can be used, which also gives an extra product when desired.

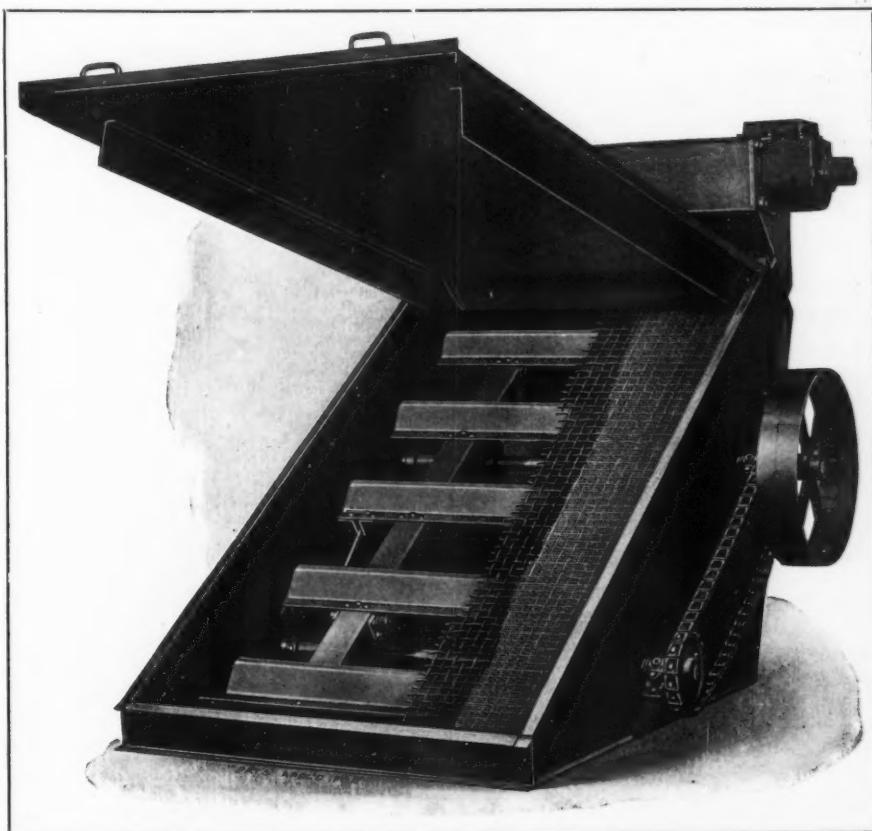
Caterpillar Traction for Small Excavation Machinery

CATERPILLAR MOUNTING for excavating machinery is not a new thing. The Bucyrus Company was the first manufacturer that attempted to thus mount heavy excavating machinery and has profited by the field experience of a large number of steam shovels and dragline excavators. This type of mounting has been so successful that it is now an exception that a small shovel or dragline is operated without it.

The saving of time and labor is exceedingly great. It is possible for a shovel

to move readily from one part of a job to another without requiring the services of a large number of pit men to lay planks. It enables the shovel to move about quickly. It may back away from blasts without loss of time and it can operate in flooded pits where ordinarily the entire plant would be idle. Furthermore, it can travel over muddy ground and climb steep grades with the greatest ease.

The 30-B caterpillar mounting has no complicated side frames; the use of chains in the driving mechanism has been completely eliminated. Driving is accomplished through direct gearing. The treads are entirely of cast steel with a large, smooth bearing surface, enabling the machine to travel over city streets, pavements and finished roads without damaging the road surface. The elimination of the caterpillar frame not only adds to the simplicity and strength, but permits easy access for inspection.



View of "Bucking Broncho," with door open, showing construction details and operation features

General News from Rock Products Markets

Directors' Meeting of National Lime Association

THE NATIONAL LIME ASSOCIATION Directors' meeting held in Philadelphia April 7 and 8 turned out to be quite a live wire meeting and lasted three days instead of two, as planned. The first day was devoted almost exclusively to the routine of reports and regular business. Acting Secretary E. O. Fippin submitted some very interesting literature which has been compiled by the association and which was accepted and will be published.

On the second day an automobile party of 23 was made up and a trip to the Charles Warner Lime Co. and the Knickerbocker Lime Co. at Cedar Hollow was made. The new machinery being installed in the plants was inspected and the party was the guest of the Knickerbocker Lime Co. for luncheon. The entire day was thus consumed and the party returned to Philadelphia late that night.

On the third day, Committees on Uniform Cost Accounting and Trade Relations were reappointed and new committees on Accident Prevention and Industrial Insurance were appointed. In the future the committees on Trade Relations and Industrial Insurance will be active units and will have definite tasks to perform.

In conclusion the place and the date of the next annual meeting of the National Lime Association was decided. The place will be New York City and the time, June 16, 17 and 18. E. O. Fippin has been re-appointed Acting Secretary until the June meeting. At this time a permanent secretary will be elected.

Atlas Portland Cement Co. Leases Coosa Company's Plant

THE ATLAS PORTLAND CEMENT CO., of New York, has taken a six months' lease, with option of purchase, on the properties of the Coosa Portland Cement Co., at Ragland, Ala. Baltimore investors are largely interested in the Coosa property, which, at one time, was practically controlled by Baltimore and Philadelphia capitalists.

The Atlas Company, which supplies all the cement for the Panama Canal, is one of the largest concerns of its kind in the world. It was announced by one of the officials interested that in case the Atlas Company exercises its purchase option it will guarantee principal and interest of the first mortgage bonds of the Coosa Company. Ragland, where the Coosa Company's plant is located, is near Birmingham, Ala.—Baltimore, Md., Star.

The Red Light Signal

GREATER COAL movement during the summer months. Reduce freight rates on coal shipped during the summer to encourage greater tonnage and greater haulage. This is a shrewd move by the coal dealers. This means more cars for coal. Less for stone. The New York State Highway Commission flashes warning to road officials and material producers. It seems that effort is being made to have railroad officials say that road building material is not desirable traffic.

Once more the attempt is to make road building material the goat. Hubbard's motto is good. Get your head in the game. Do what is best to get a square deal. Do it now.—The National Crushed Stone Association Bulletin.

No War Tax Exemption on Road Material, Railroads Claim

IT HAS BEEN REPORTED that some of the railroads have undertaken to collect in the form of undercharges the 10 cents per ton allowed by the administration on road materials, on the grounds that such materials as were not entitled to exemption from war tax on freight charges, as per ruling of the revenue department, could not be entitled to the reduction of 10 cents per ton in freight rate as authorized by Director Chambers in his circular No. 9. Acting on advice from the attorney general Superintendent Bradt has notified contractors that the state will not reimburse them account of such undercharges paid.

It is a moot question as to whether the reduction of 10 cents per ton, authorized by Director Chambers in circular No. 9, to apply on sand and gravel and similar materials used in road work from May 1 to December 31, 1919, and extended by supplement to and including February 29, 1920, will not, under the rate provision in the transportation act, remain in force during the guaranty period of six months or until changed by action of the Interstate Commerce Commission. The Illinois Division of Highways has an opinion from the attorney general that the present legal freight rate on these road materials is as authorized by circular No. 9 and subsequent supplements thereto, or, in other words, 10 cents less than the published tariff rate. The matter has been presented to proper authorities for final decision.—*Illinois Sand and Gravel Producers' Association Weekly Bulletin*.

United Gypsum Co. Reincorporated in Illinois

THE UNITED STATES GYPSUM CO., with headquarters in Chicago, will reincorporate and recapitalize under the laws of Illinois. The capitalization will be increased from \$10,000,000 to \$18,000,000. Approximately 90 per cent of the stockholders have given assent to the plan, which will be put into effect, in the near future.

The company now has \$6,000,000 preferred and \$4,000,000 common stocks, both of \$100 par value.

Under the recapitalization plan there will be \$10,000,000 preferred, part of which will be exchanged share for share for old preferred, and 400,000 shares of common stock, either \$20 par or no par value, representing \$8,000,000. The new common stock will be exchanged five shares for one of old common.

This exchange of stocks will leave \$4,000,000 each of new preferred and common stocks unissued, which will be offered to stockholders pro rata and sold from time to time as more working capital is needed.

"The principal office of the company is in Chicago," President Sewell L. Avery said. "The new Illinois incorporation law is more liberal, and it will be decided to our advantage to be incorporated under the laws of the state where our principal place of business is located, and from which our activities are largely directed. The company originally was incorporated under the laws of New Jersey."

Builders' Supply Man's Views of Material Market Conditions

GRADUAL DECREASE in the prices of building materials is to be expected soon, according to the Columbus Builders' Supply Co. One of the officials of the company said, in the Columbus Citizen: "Prices on all of our lines, we believe, have reached the peak, and will gradually be reduced. This is due to our confidence that with good weather in sight, production will be greatly increased. This, with car service improved, which is expected, now that the railroads are back to private ownership will tend to reduce prices in general. Our opinion is that the extreme high prices are due to the limited production rather than to labor cost or any other items connected."

He further states: "All manufacturers of builders' materials have been running on about half production, due to many conditions over which they had no control, but from the inquiries we made, these conditions are being gradually overcome."

General News from Rock Products Markets

Lime Association Bulletins Ready for Distribution

THE FOLLOWING BULLETINS, just off the press, are now available for distribution by the National Lime Association:

Agricultural Department
Bulletin 100—What Is Agricultural Lime? 4 pages.

Bulletin 106—Burnt Lime vs. Caustic Lime for Use on Soil. 4 pages.

Bulletin 107—Does Burnt Lime Destroy Humus? 4 pages.

Chemical Department

Bulletin 200—A New Method of Sewage Disposal. 16 pages.

Construction Department

Bulletin 300—Ideal Brick Mortar. 32 pages.

Bulletin 301—Watertight Concrete. 24 pages.

Bulletin 302—Improving Cement Products. 12 pages.

Bulletin 303—Test Data on Lime in Concrete and Mortar. 20 pages.

The first group, that of agricultural bulletins, make clear the terminology now in use in connection with agricultural lime and set forth in some detail the effects of burnt lime on the soil.

For those who are following the constantly increasing use of lime in all classes of concrete much of interest will be found in the third group of bulletins by the construction department of the National Lime Association.

Construction Season Starts Strong in Indiana

EVANSVILLE, Ind.—With the coming of more settled weather it is expected that building operations in Evansville, as well as many of the other towns in southern Indiana, southern Illinois and western and northern Kentucky will show renewed activities. More building now is under construction than this time last year.

All the organized labor crafts of the city have demanded a higher scale of wages and in almost every instance the increase asked for has been granted by the contractors. Bricklayers, hod carriers, lathers, plumbers and electricians are all receiving a higher scale of wages than they got last year. The price of all building materials is higher than last year, but in the opinion of contractors the prices are up to stay for the entire year. Prospective builders, realizing this, are going ahead with their building programs.

The demand for sand and gravel is strong and, in fact, much better than last spring. Sand and gravel companies here are busy and their fleets of boats

are at work practically every day on the Ohio River.

Rock quarries at Hopkinsville, Ky.; Milltown, Ind., and at other points in the tri-state territory are busy just now and a good season is anticipated. Many rock roads are being planned or are in course of construction in the tri-state territory this spring.

Association Advocates Early Purchase of Aggregate

THE WISCONSIN MINERAL AGGREGATE ASSOCIATION carries an advertisement in the "Good Roads for Wisconsin" magazine. In the April issue the advertisement will point out to all purchasers the advisability of making early purchases of road material.

It is believed that this will aid in securing maximum shipments in the early spring months.

This work not only aids the good roads movement, but also puts the producers before the public in their own state.

In Spite of Adverse Conditions Building Operations Increase

ALTHOUGH there has been much talk of construction being held up on account of high prices, high wages, and shortage of material, the total amount of contracts awarded during March in the territory east of the Missouri and north of the Ohio rivers, according to statistics compiled by the F. W. Dodge Co., showed a great increase over the figures for January and February, and was, in fact, greater than the figure for any month in 1919. The total amount for March was \$327,897,000, as against \$235,848,000 for January, and \$216,663,000 for February.

These figures give \$780,408,000 as the total for the first quarter of 1920. Normally the first three months of the year account for about 20 per cent of the year's total of work started. In the first quarter of 1919 contracts awarded amounted to \$275,555,000. Of the total for the first three months of the year, \$267,193,000, or 34 per cent, was for industrial buildings; \$150,651,000, or 19 per cent, was for residential buildings; and \$146,973,000, or 19 per cent, for public works and utilities. This shows that the work which has been held up is in the residential group, that is the smaller building operations. Normally, this group accounts for about 30 per cent of the total, and at the present time, in view of existing needs, it should be about 40 per cent of the total.

Although contracts have been awarded to the amount of 780 millions of dollars there is still a vast amount of work being held up for more favorable conditions. In the first quarter of 1920, contemplated and projected work of all kinds was reported by the F. W. Dodge Co. to the amount of \$1,700,000,000. Of the contemplated work, public works and utilities amount to \$363,802,000, or 21 per cent of the total; industrial buildings amount to \$355,073,000, or 21 per cent of the total; and residential buildings amount to \$343,173,000, or 20 per cent of the total.

Asbestos Industry of United States Is Developing

A CIRCUMSTANCE of considerable importance to the asbestos industry has recently been noted in "Asbestos," published by the Secretarial Service, 721 Bulletin Building, Philadelphia, Pa. It is well known that during the years 1915 and 1916 considerable "Cape Blue" asbestos was imported into the United States to supplement the Canadian and Arizona supply.

The crude fiber was treated in the same way as Canadian fiber, but in general the product obtained was unsatisfactory. Similar results were obtained when blue asbestos was first used in Europe. In order to overcome the objections of manufacturers, the Cape Asbestos Co., of London, England, the largest producers of blue asbestos, established a spinning plant, and demonstrated that the product is well suited for certain purposes, provided it is properly treated.

In order to build up a reputation for blue fiber in the United States, a new corporation, associated with the Cape Asbestos Co. and known as Asbestos Limited, has recently been chartered under the laws of New Jersey. The offices are at 8 West Fortieth Street, New York City, and the works at Bound Brook, N. J.

It is the purpose of this corporation to prepare all crude blue fiber for carding machine by a special process which it is claimed is more satisfactory than methods formerly employed in this country. The prepared fiber will be sold to manufacturers. The establishment of this plant marks an important step in the development of a blue asbestos industry in the United States.

While blue asbestos cannot be substituted for white fiber for all purposes, it is well adapted for certain uses, and its wider use would tend to relieve the present critical shortage of Canadian crude.—U. S. Bureau of Mines, Reports of Investigations.—Oliver Bowles.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, 1/4 inch down	1/2 inch and less	3/4 inch and less	1 1/2 inch and less	2 1/2 inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.						
Burlington, Vt.	1.00		2.50	2.00	2.00	
Chaumont, N. Y.		1.75	1.65	1.35	1.25	1.25
Coldwater, N. Y.	1.80	1.80	1.80	1.65	1.65	2.00 @ 2.408
Limekiln, Md.	1.25	2.10	2.00	1.75	1.40	1.25
North Leroy and Akron, N. Y.	1.00	1.00	1.00	1.00	1.00	1.00
Utica, N. Y.	1.00					
CENTRAL:						
Alden, Ia.	.70	.70	1.35	1.35	1.35	1.35
Alton, Ill.	2.00	1.50	1.50	1.50	1.50	
Bettendorf, Ia.			1.50 per cu. yd., all sizes			
Buffalo, Ia.			1.60	1.50	1.50	
Chicago, Ill.	1.25	2.00	1.65	1.50	1.50	1.50
Cincinnati, Ohio		2.00	2.00	2.00		
Cleveland, Ohio		2.40	2.20	2.20		
Davenport, Ia.	1.50*	1.50*	1.50*	1.50*		
Detroit, Mich.		2.40	1.70	1.60		
Dundas, Ont.	.75	1.35	1.35	1.35	1.25	1.10
Elmhurst, Ill.	1.00 @ 1.25	1.00 @ 1.25	1.00 @ 1.25	1.00 @ 1.25	1.00 @ 1.25	1.00 @ 1.25
Ft. Wayne, Ind.	1.60	1.90	1.90	1.80	1.60	1.60
Greencastle, Ind.	1.50	1.25	1.10	1.00	1.00	
Hull, Canada	2.50	2.30	2.50	2.10	2.00	1.75
Illinoian, Southern	2.00	1.50	1.50	1.50	1.50	
Krause, or Columbia, Ill.	1.80	1.30	1.50	1.40	1.30	
Laumon, Wis.	1.25	1.25	1.25	1.25	1.25	1.25
Lima, Ohio	1.40	1.40	1.40	1.40	1.40	
Mansfield, Ohio	1.70	2.20	2.00	1.90	1.70	1.70
Mayville, Wis.	.90 @ 1.00	1.35 @ 1.50	1.10 @ 1.20	1.10 @ 1.20	1.10	1.10
Oshkosh, Wis.			1.40 per ton, all sizes			
River Rouge, Mich.	1.25	1.50	1.50	1.50	1.50	
St. Louis, Mo.	.60	1.60				
Silica, Ohio	1.00	1.50	1.30	1.20	1.00	1.00
Stone City, Ia.	.80		1.60	1.50	1.40	
Toledo, Ohio, f. o. b. cars.	1.60	2.10	1.90	1.80	1.60	
Toronto, Canada	1.55	2.25	2.25	2.25	2.05	2.00
SOUTHERN:						
Brooksville, Fla.	1.00			3.00		
Cartersville, Ga.		2.75	2.75	2.75	2.75	
Chickamauga, Tenn.	1.50	1.75	1.75	1.75	1.75	
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	
Fort Springs, W. Va.	1.25	1.45	1.85	1.75	1.50	1.40
Mascot, Tenn.		1.50 @ 1.75	1.50 @ 1.75	1.50 @ 1.75		
Memphis Jct., Ky.			1.10 @ 1.35, all sizes			
New Braunfels, Tex.	.60	1.75	1.65	1.50	1.50	1.50
WESTERN:						
Atchison, Kans.	.50	2.00	2.00	2.00	1.90	1.90
Blue Springs and Wymore, Neb.	.25	1.75	1.75	1.65	1.55	1.50
Kansas City, Mo.	.60	2.00			1.75	1.50
Mankato, Minn.						

Crushed Trap Rock

Screenings, 1/4 inch down	1/2 inch and less	3/4 inch and less	1 1/2 inch and less	2 1/2 inch and less	3 inch and larger
(2.75 @ 2.85, all sizes)					

Miscellaneous Crushed Stone

Screenings, 1/4 inch down	1/2 inch and less	3/4 inch and less	1 1/2 inch and less	2 1/2 inch and less	3 inch and larger
Cubic yard. †Agrl. lime. R. R. ballast. #Flux. †Rip-rap. a 3-inch and less.					
Dundas, Ont.—Flint	1.10	1.10	1.10	1.10	1.10
Little Falls, N. Y.—Syenite	.80	1.20	1.40	1.20	1.20
Mayville, Wis.	.90 @ 1.00	1.10 @ 1.25	1.10 @ 1.25	1.10 @ 1.25	1.10 @ 1.25
Middlebrook, Mo.—Granite	3.50		1.75	1.75	
Portland, Maine—Granite	1.50				
Roseburg, Ore.		1.50	1.25	1.05	1.00
Stockbridge, Ga.—Granite	.50	2.00	1.90	1.75	1.75
White Haven, Pa.—Sandstone	.85	1.20	1.40	1.20	1.20
Granite	1.25		1.50	1.50	1.50

Agricultural Limestone

EASTERN:		
Coldwater, N. Y.—Analysis, 56.77% CaCO ₃ , 41.74% MgCO ₃ —70% thru 200-mesh, 95% thru 40-mesh; bags, \$5.00; bulk		3.25
Chaumont, N. Y.—Analysis: CaCO ₃ , 92 to 98%; MgCO ₃ , 1.51%—(Thru 100 mesh); sacks, 4.00; bulk		2.50
Grove City, Pa.—Analysis: CaCO ₃ , 94.75%; MgCO ₃ , 1.20%—(70% thru 100 mesh); 80 lb. ppr., 4.60; bulk		3.25
Grove, Md.—90% thru 4 mesh; bulk		3.00
Hillsville, Pa.—Analysis, CaCO ₃ , 96% (90% thru 100 mesh); sacks, 4.50; bulk		2.75
Jamesville, N. Y.—68% thru 100 mesh; 95% thru 50; 100% thru 20. Sacks, 3.75; bulk		2.25
Syracuse, N. Y.—Analysis, 90% carbonates (50% thru 100 mesh, 90% thru 50 mesh); sacks, 3.50; bulk		1.75
Walford, Pa.—(70% thru 100 mesh; 85% thru 50; 50% thru 50; 100% thru 4); sacked, 4.25; bulk		2.75
West Stockbridge, Mass.—Analysis: Combined carbonate, 95%—33% thru 200 mesh; 66% thru 100; 100% thru 40. Bulk		2.85
Williamsport, Pa.—Analysis, CaCO ₃ , 88.90%; MgCO ₃ , 3.4%—(50% thru 50 mesh); sacks, 4.50; bulk		3.00
CENTRAL:		
Alden, Iowa—Analysis, CO ₃ , 99.16%; bulk		.80
Alton, Ill.—Analysis: CaCO ₃ , 96%; MgCO ₃ , 0.75%—50% thru 4 mesh		2.50
Bedford, Ind.—(90% thru 10 mesh) Analysis, CaCO ₃ , 98.5%; MgCO ₃ , 0.5%		1.75
Belleview, Ont.—Analysis, CaCO ₃ , 99.9%; MgCO ₃ , 1.15% (45 to 50% thru 100 mesh; 61 to 70% thru 50 mesh); bulk		2.50
Chicago, Ill.—Analysis, CaCO ₃ , 53.63%; MgCO ₃ , 37.51%—90% thru 50 mesh		1.00
Columbia, Ill., near East St. Louis (3/4" down)		1.25 @ 1.80
Ellettsville, Ind.—Analysis, Carbonate, 98%		2.00
Elmhurst, Ill.—(Analysis, CaCO ₃ , 35.73%; MgCO ₃ , 20.69%) 50% thru 50 mesh		1.25
Greencastle, Ind.—(Analysis, CaCO ₃ , 98%) 50% thru 50 mesh		1.75
Howenstein, O.—100% thru 10 mesh; 59% thru 50; 39% thru 100		2.75 @ 3.00
Kansas City—(50% thru 50 mesh)		2.00
Lannon, Wis.—(90% thru 50 mesh) Analysis, 54%, CaCO ₃ ; 44%, MgCO ₃		2.00
Marblehead, O.—(Analysis: CaCO ₃ , 95.33%) 100% thru 100 mesh, sacks, 4.75; bulk		2.75
McCook, Ill.—Analysis, CaCO ₃ , 54.10%; MgCO ₃ , 45.04%—100% thru 3/4" sieve; 78.12% thru No. 10; 53.29% thru No. 20; 38.14% thru No. 30; 26.04% thru No. 50; 16.27% thru 100		90 @ 1.00
Milltown, Ind.—Analysis, CaCO ₃ , 94%; MgCO ₃ , 3%—(100% thru 4 mesh)		1.50
Montrose, Ia.—(90% thru 100 mesh)		1.25
Muskegon, Mich.—(90% thru 50 mesh) Analysis, CaCO ₃ , 53.35%; MgCO ₃ , 43.27%		2.50
Piqua, O.—Analysis: CaCO ₃ , 82.8%; MgCO ₃ , 8.2%; neutralizing power in terms of calcium carbonate, 95.3%—70% thru 100 mesh; bulk		2.75 @ 4.50
Stolle, Ill. (near East St. Louis on L. C. R. R.)—(Thru 3/4" mesh) Analysis, CaCO ₃ , 89.61 to 89.91%; MgCO ₃ , 3.82%		2.00
St. Paul, Ind.—Analysis, CaCO ₃ , 85%; MgCO ₃ , 12%		1.50
Stone City, Ia.—Analysis, CaCO ₃ , 98% (50% thru 100 mesh)		.80
Toledo, O.—Analysis, CaCO ₃ , 52.72%; MgCO ₃ , 43%—(20% thru 100 mesh); 30% thru 50; 80% thru 100; 100% thru 5/32 screen)		1.80
Whitehill, Ill.—Analysis, CaCO ₃ , 96.12%; MgCO ₃ , 2.50%—90% thru 50 mesh, bulk		2.00
Whitehill, Ill.—Analysis, CaCO ₃ , 96.12%; MgCO ₃ , 2.50%—90% thru 100 mesh		5.00

(Continued on next page.)

Agricultural Limestone

(Continued from preceding page.)

SOUTHERN:

Cartersville, Ga.—Analysis: 96 to 98% combined carbonates—All thru 10 mesh with all dust in...	2.75
Clarendon, Va. (Marlimestone)—Analysis, 90.94% CaCO_3 , 0.31% F, 1.36% Mg, 0.37% K; bulk...	4.50
100 lb. ppr. bags...	6.00
100 lb. cloth bags...	6.50
Dittlinger, Tex.—Analysis, CaCO_3 , 99.09%; MgCO_3 , .04%.	
90% thru 100 mesh...	
90% thru 4 mesh...	
Groveravia, Ga.—Analysis, CaCO_3 , 95%; MgCO_3 , none—50% thru 100 mesh...	
Hopkinsville, Ky.—Analysis, 94.6 to 98.1% CaCO_3 —Bulk...	
Linville Falls, N. C.—Analysis, CaCO_3 , 54%; MgCO_3 , 42%—50% thru 100 mesh; sacks, 4.00; bulk...	
Marion, Ga.—Analysis, 90% CaCO_3 —(50% thru 100 mesh)...	
Memphis Jct., Ky.—(Analysis, CaCO_3 , 95.31%; MgCO_3 , 1.12%); average price, $\frac{1}{2}$ in. down...	
Mascot, Tenn.—Analysis, CaCO_3 , 52%; MgCO_3 , 38%.	
(80% thru 100 mesh)...	
(All thru 10 mesh)...	
(80% thru 200 mesh)...	
Paper bags, \$1.50 extra per ton; burlap, 2.00 extra per ton.	
Maxwell, Va.	
Mountville, Va.—Analysis, CaCO_3 , 76.6%; MgCO_3 , 22.8%—100% thru 20 mesh; sacks, 5.50; bulk...	
Ocala, Fla.—Analysis, CaCO_3 , 98%—(75% thru 200 mesh)...	
Tyron, Ky.—Analysis, CaCO_3 , 93%; MgCO_3 , 6%—90% thru 4 mesh...	
Winnfield, La.—(50% thru 50 mesh)...	

WESTERN:

Cement, Calif.—50% thru 50 mesh...	
Colton, Calif.—Analysis: CaCO_3 , 95%; MgCO_3 , 1/2%; bulk, 2.50; bags, sacks, 15c extra, returnable.	
Kansas City, Mo., Corrigan Sid'g—50% thru 50 mesh; bulk...	
Terminus, Calif.—Analysis, 94% CaCO_3 , 1.4% MgCO_3 —(60% thru 200 mesh; 90% thru 100 mesh; 100% thru 40 mesh); sacks, 4.50; bulk...	

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Berkeley Springs, W. Va.....	2.25@2.75
Special hand selected rock.....	2.50
Bridgeton, N. J.....	2.00
Cedarville and South Vineland, N. J.—	
Glass, damp.....	2.00
Glass, dry.....	2.50
Grav Summit, Mo.....	2.00@2.50
Guion, Ark.—Carlots.....	2.00
Hancock, Md.—Damp.....	2.00
Klondike and Pacific, Mo.: Contracts.....	2.00
Carlots.....	3.00
Mapleton, Pa.....	2.50
Glass, damp.....	2.00
Massillon, Ohio.....	3.00
Michigan City, Ind.....	.50
Millington, Ill.—Contracts.....	2.00
Mineral Ridge, O.....	3.00
Montoursville, Pa.—Green, washed.....	1.50
Oregon, Ill.—Large contracts.....	1.75
Open market.....	2.50
Ottawa, Ill.....	2.00@2.50
Robinson, Md., washed, screened, not dried.....	2.00
St. Marys, Pa.—Green.....	2.50
Sands, Elk Co., Pa.—Selected, green.....	2.75
Thayers, W. Va.—Washed.....	2.75
Unwashed.....	2.50
1.75@2.50	
Utica, Ill.....	

FOUNDRY SAND:

Albany, N. Y.—Molding coarse.....	2.00
Molding fine.....	2.75
Brass molding.....	2.75
Allentown, Pa.—Core.....	1.50@1.75
Molding coarse.....	1.50
Arenzville, Ill.—Molding fine.....	1.75@2.00
Beach City, Ohio—Core.....	2.50
Green silica sand (not dried).....	2.25
Washed silica sand (not dried).....	2.50
Sand blast.....	2.75@3.50
Bowmowntown, Pa.—Core.....	1.25
Plastering sand.....	1.30
Molding fine and coarse.....	1.50
Bridgeton, N. J.—Core.....	2.00

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine sand, 1/10 inch down	Sand, 1/4 inch and less	Gravel, 1/2 inch and less	Gravel, 1 inch and less	Gravel, 1 1/2 inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge, South Heights, Pa.		1.30	.75	1.00	1.00	1.00
Attica, N. Y.	.75	.75	.75	1.00	1.00	1.00
Concord Jct., Mass.	1.25	1.00	1.50	1.50	1.50	1.50
Farmingdale, N. J.	.68	.48	1.50	1.35	1.35	1.30
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Ludlow, Mass.					1.10	1.00
Morristown, N. J.	.60	.60	1.75		1.40	1.35
Portland, Me.					1.25	
Washington, D. C. (F. O. B. wharves on cars)	.75	.75	2.00	1.40	1.20	1.20
Yardville, N. J.			.50@ .75, all sizes			
CENTRAL:						
Alton, Ill.	.60@ .75	.60@ .75	1.50@4.50	1.30	1.20	1.20
Attica, Covington, Silverwood, Ind.	.85	.85	.85	.85	.85	.85
Barton, Wis.	.85	.70	1.00	.80	.80	.80
Beloit, Wis.			.60 sand, 1.00 gravel			
Chicago, Ill.		1.20@1.50		1.20@1.50		
Columbus, Ohio	.70@1.00	.70@1.00	.70@1.00	1.00	.70@1.00	.70@1.00
Covington, Ind.	.75	.75	.85	.75	.75	.75
Des Moines, Ia.	.75@1.00	.75	1.65	1.65	1.50	1.50
Earlestad (near Flint), Mich.	.60	.60				
Eau Claire, Wis.	.70	.70	2.25		1.35	
Elgin, Ill.		.80	1.00	.80	.80	.80
Ft. Dodge, Ia.	1.50	1.40	2.30	2.30	2.30	2.30
Ft. Jefferson, Mechanicsburg, O.	.70	.60	.80	.70	.70	.70
Grand Rapids, Mich.	.50	.60	1.00	.90	.80	.80
Grass, Mich.		1.00	1.60	1.20	1.20	1.20
Greenbush, Mich.	.50	.80	1.00	1.25		
Indianapolis, Ind.	.60	.60		.75	.75	.75
Mason City, Ia.	1.00	.90	2.00	1.85	1.75	1.65
Milwaukee, Wis.	1.25	1.25	1.35	1.35	1.35	1.35
Minneapolis, Minn.	.50	.50	2.00	2.00	1.75	1.75
Oxford, Mich.			(60-40 mix, .85 per ton)			
Pittsburgh, Pa.			(Sand, 1.30; gravel, 1.00)			
Summit Grove, Ind.	.85	.85	.85	.85	.85	.85
Terre Haute, Ind.	.75	.75		.85	.75	.75
Toledo, Ohio	.75	.75				
Yorkville, Moronts, Oregon and Ottawa, Ill.	.70	.80	.90	.80	.80	.75
SOUTHERN:						
Alexandria, La.		.80				1.35@1.75
Blomont, Ala.		.85			1.80	
Knoxville, Tenn.	1.15	1.15	1.50	1.50	1.50	1.40
Lake Weir, Fla.		.60				
Lincoln, Neb.	.90	.90	2.20	2.20		
Macon, Ga.		1.00				
Memphis, Tenn.			(Sand, 1.25 per cu. yd.; gravel, 1.50 per cu. yd.)			
N. Martinsville, W. Va.		1.10@1.20				.90@1.00
Pelzer, S. C.	.80	.80				
Pine Bluff, Ark.	1.20	1.20			1.25	
Roseland, La.		.35				
Thomas, La.	.60					1.75
Tulsa, Okla.		.70				
Waco, Texas	.70@ .80	.70@ .80				1.10
WESTERN:						
Essex, Humboldt Co., Calif.		1.35	1.35	1.35	1.35	1.35
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.			(Kaw River sand, car lots, .75 per ton, Missouri River, 1.50)			
Niles, Calif.	.80@1.00	.70@ .85	.75@1.00	.70@1.00	.70@1.00	.70@1.00
Saratoga, San Jose, Calif.		.60@ .75	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Seattle, Wash.	1.25	1.25	2.00	1.25	1.25	1.25
Vancouver, B. C.		1.30*		1.30*		1.10*
Yorkville, Ore.	.60	.60@ .75	.70	.60@ .75	.60	.50@ .60

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, 1/4 inch and less	Gravel, 1/2 inch and less	Gravel, 1 inch and less	Gravel, 1 1/2 inch and less	Gravel, 2 inch and less
EASTERN:						
Boonville, N. Y.	.60@ .85	.60@ .75				
Burnside, Conn.		.80*				
Fishers, N. Y.	.70@ .80	.75@ .90				
Yardville, N. J.		.50@ .75				
York, Pa.		1.10@1.30	(crushed rock sand)			
CENTRAL:						
Earlestad, (near Flint, Mich.)				.60 per yd.		
Ft. Jefferson, Mechanicsburg, O.	.70	.60	.60	.60		
Grand Rapids, Mich.	.40			.75		
Grass, Mich.	.60	1.00	1.00	1.00		
Greenbush, Mich.	.65			.60		
Hershey, Mich.						
Illinois, Northern						
Janesville, Wis.						
Lincoln, Neb.						
Oxford, Mich.						
Summit Grove, Ind.	.65	.65	.65	.65		
Yorkville, Oregon, Moronts and Sheridan, Ill.						
SOUTHERN:						
Albany, Ga.		.70@1.00				
Dudley, Ky. (Crushed Sand)		.95		1.00		
Lindsay, Tex.		1.00				
Thomas, La.						
Valde Rouge, La.						
Waco, Texas						
WESTERN:						
Niles, Calif.		.25@ .40				
Pueblo, Col.						
Saratoga, San Jose, Calif.						
Yorkville, Ore.						

* Cubic yard. B Bank. L Lake. || Ballast.

River Run, .75* unscreened .60@ .70 .60@ .70 .60@ .70 .60@ .70

Crushed Slag

City or shipping point EASTERN:	Screenings.		1/4 inch and less	3/4 inch and less	1 1/4 inch and less	3 1/2 inch and less	3 inch and larger
	Roofing	down					
Bethlehem and Emmaus, Pa.	2.50	.90	1.50	1.00	1.00	1.00	1.00
Buffalo, N. Y.	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Cleveland, Ohio.	—	.85	—	—	—	—	—
E. Canaan, Conn.	3.50	1.10	3.00	1.05	1.05	.95	.95
Erie, Pa.	—	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.	—	1.25	1.25	1.25	1.25	1.25	1.25
Ensley, Ala.	2.05	1.00	1.25	1.25	1.25	1.25	1.25
Hokendauqua and Donaghmore, Pa.	2.50	.90	1.50	1.00	1.00	1.00	1.00
Lebanon, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Philadelphia, Dist.	2.50	1.00	1.50	1.00	1.00	1.00	1.00
Pittsburgh, Pa., Dist.	2.05	1.15	1.50	1.15	1.15	1.15	1.15
Sharpsville, Pa.	2.00	1.20	1.60	1.20	1.20	1.20	1.20
CENTRAL:							
Chicago, Ill.	—	—	All sizes, \$1.50, F. O. B. Chicago	—	—	—	—
Detroit, Mich.	—	—	All sizes, 1.65, F. O. B. Detroit	—	—	—	—
Ensley, Ala.	2.05	1.00	1.10	1.25	1.25	1.00	.95
Ironton and Jack- son, O.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
Toledo, O.	—	—	All sizes, 2.00, F. O. B. Toledo	—	—	—	—
Youngstown, Dover, Hubbard and Lee- tonia, O.	2.00	1.20	1.60	1.20	1.20	1.20	1.20

Agricultural Lime and Hydrate

	Agricultural Lime— Bulk	Agricultural Lime— Bags	Per Cent CaO	Per Cent MgO	Agricultural Hydrate Bags
EASTERN:					
Adams, Mass.			98	38	8.00
Apollo, Pa.	3.25		95.14	1.44	
Bellefonte, Pa.	8.00		98.5	.72	11.50
Berkeley, R. I.			14.00	45	
Bridgeport, Pa.				55	15
Cavendish, Vt.					44
Cavetown, Md.					9.00@11.00
Cedar Hollow, Devault, Rambo and Swedeland, Pa.	8.50				2.50 bbl. in car lots
Chippewa, Pa.	8.00	10.75 grd.	58	38	10.75
Farnams, Mass.	6.00		78.67	1.33	
Frederick, Md.	6.00	7.50	60	2	
Grove City, Pa.	7.75		88	5 to 8	10.50
Grove, Md.	3.25	4.50	94.75	1.20	10.25
Highgate Springs, Vt.	8.00				10.75
Hollidaysburg, Pa.					8.00
Hyndman, Pa.	5.50@7.50		94.68		
Lime Bluff, Pa.	5.00	8.50	80.23	2.87	
Lime Kiln, Md.	5.00@6.25		78.67	1.33	
Lime Ridge, Pa.	8.00	10.75			10.75
Newburgh, N. Y.	5.25		80.56-62.56	3.87-1.75	
New Castle, Pa.			57	38	8.00
Paxtang, Pa.	3.50	4.50	47.6 to 50.4	0.62 to 1.12	
Rosendale, N. Y.	5.50@7.00		60	12	
Sandyville, O.	8.00	9.00	92	5	
Steuben, Pa., Dover Plains, N. Y., York, Pa.					9.00
Union Bridge, Md.		7.00@9.50	70		10.75 to 12.00
Williamsport, Pa.	8.50		73	1	10.75
Williams Station, Pa.	5.50	10.00	65 to 80	2 to 4	10.00
York, Pa.	7.50		60.6	39.1	9.75@10.50
CENTRAL:			90 to 95	2 to 7	10.75
Alton, Ill.	10.50		94.0		
Delaware, O.			50.0	5-12	10.50
Forest, O.			50.0		
Knowles, Wis.	7.50				
Manistique, Mich.					
Marblehead, Ohio					
Mitchell, Ind.					
Sheboygan, Wis.					
Springfield, Ohio					
Woodville, Ohio					
SOUTHERN:					
Blowers, Fla.	5.00	7.25	98.0		
Burns, Tenn.	9.50		96	0.54	13.00
Chippewa, Fla.	5.00		80.0	15.0	
Dittlinger, Texas			98.62	0.29	12.50@15.00
Erin, Tenn.			97.82	0.12	
Karo, Va.	9.50		97.0	1.26	
Lineton, Va.	8.00				
Lushing, Va.	8.50		97	1.74	
Maxwell, Va.	9.00	11.25	60	15	12.75
Newala, Ala.	6.00	9.00	88	1.75	
Ocala, Fla.					
Staunton, Va.	8.50@9.00	6.00 pulv.	99.33		
	4.00				(dry basis)
	7.50	10.00	80.00	15.00	
WESTERN:					
Bellins, Wash.					12.00
Colton, Calif.	4.50				
Kirkland, N. Mex.	12.00				
Lime, Ore.	15.00		91.48	0.58	
Ocas Island, Wash.			5.50		
San Francisco, Calif.			96	0.33	16.50
Tehachapi, Cal.	6.00	8.00	96	0	15.00

Miscellaneous Sands

(Continued from preceding page)

(Continued from preceding page)	
Cleveland, O.—Molding coarse	2.50
Brass molding	2.50
Molding fine	2.75
Columbus, O.—Core	2.00
Brass molding	2.50
Molding fine, steel molding	2.50
Connestee, O.—Molding fine	2.75 @ 3.00
Molding coarse	2.50 @ 2.75
Eau Claire, Wis.—Core	.70
Roofing gravel	2.25
Sand blast coarse	3.50
Sand blast medium, fine	3.00
Brass molding	2.25
Molding fine, steel molding	3.00
Molding coarse, fine, green	2.25
Sand blast	5.00
Core	2.25
Greenville, Ill.—Molding coarse red	1.75 @ 2.25
Guion, Ark.—Molding fine	2.00 @ 2.25
Roofing	3.00
Stone sawing	2.50
Hancock, Md.—Core and brass mldg.	1.65
Hellman, Pa.—Core	2.00 @ 2.50
Joplin, Mo.—Stone sawing, flint	1.25
Kansas City, Mo.—Missouri River core	.85

Klondike and Gray Summit, Mo.—

Molding fine	2.00	@ 2.50
Laurel, Fla.—Sand blast	.60	
Mapleton, Pa.—Molding, fine and core, damp	2.00	@ 2.50
Molding, fine, dry	3.00	
Massillon, O.—Molding fine	3.00	
Molding coarse	3.00	
Traction	2.75	
Furnace lining	3.00	
Core	3.00	
Michigan City, Ind.—Core, bank	.50	@ .60
Traction	.50	
Millington, Ill.—Roofing, stone sawing	2.00	
Core and furnace lining	1.75	
Core	1.50	
Mineral Ridge, O.—Core, molding, sand blast, roofing, brass molding, etc., washed, screened (damp)	2.75	
Montoursville, Pa.—Core	1.25	@ 1.50
Traction	1.15	@ 1.35
Brass molding	1.25	
Ohio—Various points:		
Iron molding, fine	1.50	@ 2.25
Iron molding, coarse	1.75	
Brass molding, minimum	2.00	
Oregon, Ill.—Core	1.75	@ 3.00
Furnace lining	1.75	@ 3.00
Sand blast	3.00	@ 3.50
Molding fine	1.75	@ 3.00
Ottawa, Ill.—Core, furnace lining	2.50	
Core	2.50	
Roofing sand	2.00	@ 3.00
Sand blast	5.00	
Providence, R. I.—Molding fine	2.00	
Molding coarse	1.90	
Brass molding	2.25	
Sand blast	3.00	@ 4.00
Sugar Grove, Ohio—Core (dried and screened)	2.00	
Traction	2.00	
Thayers, Pa.—Core and traction	2.00	
Furnace lining, molding	1.25	
Utica, Pa.—Core	2.00	
Molding coarse, traction	2.50	
Brass molding	2.75	
Sand blast	3.50	
Warwick, Ohio—Core, furnace lining, molding fine and coarse (dry and screened)	2.50	@ 2.75
Core, furnace lining, molding fine and coarse (green)	2.25	
Wedron, Ill.—Core, (crude silica)	.75	@ 1.00
Molding fine, coarse	.75	@ 1.00
West Albany, N. Y.—Molding fine	1.75	@ 2.25
Molding coarse	1.50	
Brass molding	1.75	
Zanesville, Ohio—Molding fine and brass	2.50	@ 2.75
Molding coarse	2.25	@ 2.50

Gypsum, per Ton

Castalia, O.—Crushed, to cement mills	3.
Ground, to cement mills	3.
Land plaster	6.
Bags extra—Jute, 3.00; ppr., 1.00 per ton.	3.
Fort Dodge, Ia., bulk	3.
Garthull, N. Y.—Land plaster, bags	7.
Grand Rapids, Mich.—Crushed gypsum	4.
Ground gypsum rock	9.
Gypsumville, Man., Can. (crushed)	3.
Hickford, N. Y.	7.
Sandusky, O.	6.
Int. sacks, \$3.00 extra; paper, \$1.00 extra.	

Ground Rock Phosphate

Centerville, Tenn.—B. P. L., 70%; ton, 2000 lbs (90% thru 100 mesh)	9.00 @ 10.00
Lump rock, 72% to 75%, B. P. L.	6.00 @ 8.50
Centreville, Tenn.—B. P. L., 60%	7.00
B. P. L., 70%	9.00 @ 10.00
Gordonsburg, Tenn.—2000 lbs (90% thru 100 mesh)—B. P. L., 60%	6.00
B. P. L., 65%	7.00
B. P. L., 70%	8.50
B. P. L., 75%	12.00
Mt. Pleasant, Tenn.—(B. P. L. 68%)	
13%	7.80
14%	8.00
Mt. Pleasant, Tenn.—B. P. L., 70%	9.00 @ 10.25
Nichols, Fla.—Pebble, B. P. L., 68%..	10.00
Wales, Tenn. (95% thru 100 mesh (guaranteed 14% phosphorus equiva- lent)	7.00 @ 8.25
Walls, Tenn.—B. P. L., 70.2%—	7.50
To County Agri. Assns.	
To others	7.75



Passed By The Screens



Incorporations

Niagara Sand Co., Toronto, has been registered.

Quarry Co., Limited, Montreal, Que., has been registered.

Standard Sand Co., Ltd., Montreal, has been incorporated with a capital of \$150,000 to deal in sand, lime, stone, etc.

Federal Feldspar, Ltd., Canada, with a capital of \$40,000, has been incorporated to mine and deal in feldspar and other products.

The Williamsport Sand and Gravel Co., Williamsport, Pa., has been incorporated by D. N. Thomas, Jr., with a capital of \$45,000.

The Peace Valley Phosphate Co., Bartow, Fla., has been incorporated to mine phosphate. The incorporators are J. F. Caldwell, G. C. Long and N. E. Stewart.

The Gallup Sand and Gravel Co., Boonville, N. Y., has been incorporated with a capital of \$50,000. The incorporators are H. W. Owens, A. B. Gallup and F. E. Gallup.

The Ohio Gravel Ballast Co. has been incorporated at Dover, Del., with a capital of \$1,125,000 to quarry for ballast and gravel. The incorporators are L. B. Phillips and A. J. Kingsbury.

The Light Quick Marble Co., Knoxville, Tenn., has been incorporated with a capital of \$100,000. The incorporators are William Anderson, T. G. McConnell, E. G. Heins, A. L. Mason and R. M. McConnell.

The Slate Products Co., of Canada, Ltd., Montreal, Que., has been incorporated to carry on the business of quarrying, manufacturing and dealing in slate, stone, lime, cement, brick and gravel. The capital is \$200,000.

The Machias Sand and Gravel Co., Buffalo, N. Y., has been incorporated for the purpose of quarrying sand and gravel. The capital is \$350,000 and the incorporators are D. L. Moore, S. E. Millener and G. P. Keating.

The Tarvin Pulverizer Co., Nashville, Tenn., has been incorporated for \$100,000 to produce commercial and pulverized limestone. The incorporators are J. C. Tarvin, H. G. Tarvin, E. F. Ames, J. C. Tarvin and H. M. Tarvin.

The Trenton Lime Co., with its principal office in Remsen, N. Y., has been chartered with a capital of \$40,000. The directors are Frederick F. Brown, Byron E. Cool, James Gallagher, Jr., Byron H. McCollion and William H. Biersch, all of Remsen.

The Cedarburg Products Co., Cedarburg, Wis., has been incorporated with a capital of \$250,000 to quarry limestone and manufacture and sell the various products of the quarry industry. The incorporators are Ernst Groth, A. A. Mueller and Margaret Mollerus.

The Independent Sand and Gravel Co., Los Angeles, Calif., has been incorporated with a capital of \$25,000 to produce and deal in sand and gravel. The incorporators are W. D. Stephens, P. K. Dotson, G. W. Harrison, E. W. French and Thos. Gordon.

The Monroe Sand and Gravel Co., Monroe, Wis., has been incorporated with a capital of \$25,000 to produce and sell sand and gravel. Also to manufacture and sell concrete products and building material. The incorporators are G. S. Huxtable, A. D. Geigel and Ernst Barth.

The Minnesota Quarrying Co., St. Cloud, Minn., has been incorporated for the purpose of quarrying granite, marble, stone, etc., and working the same up for use in commercial purposes. The capital is \$100,000 and the incorporators are W. F. Donohue, president; Florence Zins, vice president, and J. J. Quigley, secretary-treasurer.

The Geneva Stone Corporation of Geneva, N. Y., has just been incorporated with the secretary of state to deal in stone, rock and lime products. The new company has a capital stock of \$350,000, consisting of shares of \$25 each and the directors are E. H. Palmer, John Parmenter, Iewan Harris, Walter Howard and Carl F. Brunt. The new corporation will take over the plant and other properties of the Geneva Limestone Co., which was sold recently under a foreclosure and was bid in by a committee representing the bondholders. The plant of the company is located at Oaks Corners, eight miles from Geneva.

The Collins Granite Co., Wilmington, N. Y., has been incorporated to mine granite. The capital stock is \$200,000 and the incorporators are M. L. Rogers, L. A. Irwin and W. G. Singer.

The Farmers' Lime Co., Coal City, Ind., has been incorporated to produce agricultural lime-stone. The capital is \$2,500. The directors are E. J. Barton, Leonard Weatherwax and Walter Leonard.

The Pleasant View Sand Co., Ashland, Ohio, has been incorporated to further develop the sand bank on the farm of T. G. Stence. The company consists of T. J. Stence, C. S. Master and W. D. Cummings.

Gypsum Products

The Gypsum companies of Port Clinton, Ohio, are reporting that the shortage of cars is meaning additional expense of hundreds of dollars to the companies, as open cars are being used and those must be supplied with a special canvas cover to protect the building materials which are shipped to distant markets.

The United States Gypsum Co., main offices in Chicago, Ill., for the year ended December 31, 1919, earned applicable to the common stock \$678,543.53 or at the rate of 17.37 per cent, according to the annual report issued. This was after paying 7 per cent on the preferred stock and also federal taxes. The balance at the end of 1919 amounted to \$1,498,871.92, compared with a balance at the end of 1918 of \$872,945.63.

Retail Dealers

The Pennsylvania Concrete Roofing, Tile and Cement Co., Lemoyne, Pa., has been incorporated with a capital of \$25,000.

The Prairie Concrete Products Co., Prairie du Chien, Wis., has filed an amendment to articles of incorporation to increase the capital from \$15,000 to \$50,000.

The Builder Shippers Corporation, Wilmington, Del., has been incorporated to deal in building material. The capital is \$100,000 and the incorporators are G. H. McGovern, F. T. Manon and J. Scence.

The J. B. Laun Co., Kiel, Wis., has been incorporated to deal in lumber, fuel and all kinds of building materials. The capital is \$100,000 and the incorporators are J. B. Laun, Paulina Laun and E. M. Duecker.

The Booker-Cannon Co., Inc., Tampa, Fla., has been incorporated to deal in building material. The capital stock is \$200,000 and the incorporators are G. V. Booker, president, and G. F. Cannon, secretary and treasurer.

The Donaldson Concrete Construction Co., Indianapolis, Ind., has been incorporated to manufacture and deal in concrete products. The capital is \$10,000 and the incorporators are C. W. Donaldson, H. G. Maas and G. L. Maas.

The Western Gravel and Cement Block Co., Indianapolis, Ind., has been incorporated to manufacture and deal in cement blocks. The capital is \$10,000 and the incorporators are Agit Sahn, M. R. Sahn and Arthur Sahn.

The Wells Cement Products Co., Wells, Minn., has been incorporated to manufacture and deal in cement products. The capital stock is \$50,000 and the officers are J. W. Hurst, president; F. J. Kinney, secretary, and Claire Hurst, treasurer.

The New Jersey Cement Block Co., Inc., 128 Market Street, Newark, N. J., has been incorporated for the purpose of manufacturing cement blocks. The authorized capitalization is \$50,000 and the incorporators are Bernard Schweitzer, L. W. Crosby and Celia Colton.

The Union Cast Stone Co., of Rock Island, Ill., has been incorporated to deal in cement products. The capital stock is \$30,000 and the recently elected company officers are: Frank Perkins, president; Louis Andrich, vice-president; and H. A. Weld, secretary. All live in Rock Island.

The Retail Lumber and Supply Co., Shawano, Wis., has increased its capital stock from \$10,000 to \$50,000. This company deals in lumber and all building materials.

Alois Fuchs, Perham, Minn., has purchased the Schornack sand pit from which he will obtain sand to be used in the manufacture of concrete block. He is also building a large concrete block factory.

The Dyker Construction Co., Brooklyn, N. Y., has been incorporated to manufacture and deal in cement blocks. The capital is \$10,000 and the incorporators are H. I. Irwin and Samuel Channin.

The Little Chute Supply Co., Little Chute, Wis., has been incorporated with a capital of \$25,000. This company will deal in all kinds of building material. The incorporators are J. A. Gloudemans, Arnold Gloudemans and John Bies.

The Elizabeth Manufacturing Co., Elizabeth, Minn., has been incorporated to manufacture and deal in cement and concrete products. The capital is \$100,000 and the incorporators are O. C. Rian, president; Frank Grouns, vice-president, and O. O. Sletvold, Jr., secretary and treasurer.

Gittner Coal and Supply Co., Waukesha, Wis., has changed its name to Gittner-Lamp Lumber and Fuel Co. It has also increased stock from \$5,000 to \$20,000 for the purpose of enlarging business to include retailing of lumber, sash and doors, etc. This company also deals in lime, cement, building materials, etc.

The Vermont Cement Brick Co., Bellows Falls, Vt., has been incorporated with a capital of \$10,000, to manufacture cement bricks. The officers of the company are: F. J. De Forge, president; M. A. Chase, vice-president; Philias Grignon, secretary and treasurer, and William Williams, manager.

The Canadian Self-Locking Concrete Wall Co., Ltd., will shortly move their head office from Canada from Seattle, Wash., to Montreal. Plants will be erected at several centers to manufacture the Sawyer System of hollow wall construction. This system invented by F. McM. Sawyer, Los Angeles, Cal., consists essentially of two-piece self-locking sectional wall, practically monolithic without the use of wooden forms.

The Memphis Concrete Products Co. will open a large manufacturing plant on Bolley Avenue, New South Memphis, Station G. The company will manufacture culverts, drains, lattice work, flower pots, tiling and concrete specialties. A brick building 60x150 ft. has been secured. R. C. Boswell will be manager. Memphis is pushing to the front in concrete and fireproof material work and contractors say that much concrete material will be used this spring.

The Forbush Lumber & Builders' Supply Co., Alamaca, N. Y., which has bought and leased the property on River Street formerly occupied by the Chesbro Milling Co., is erecting large and well arranged buildings for the handling of its business. The company will handle all kinds of lumber and builders' supplies and to do both local retail business and wholesale business. The sheds being constructed are so arranged as to permit unloading direct from the car on the switch into the building and direct from the building to trucks all under one roof. D. B. Forbush, the president of the company, has been in business in Gowanda for thirty years and has built a business from a very small start until now from his Gowanda plant he ships material throughout Western New York. He has also had a plant in operation at South Dayton for 14 years. Mr. Forbush will have direct charge of the purchasing of all lumber and supplies.

Manufacturers

The Wilmot Engineering Co., works at White Haven, Pa., which manufactures Keystone Rivetless Chain, has recently issued Catalog No. 19 on Rivetless Chains for conveyors and elevators. The Frank W. Watts Co., sales engineers, whose general offices are in the Pennsylvania Building, Philadelphia, Pa., acts as sales agent for the Wilmot Engineering Co. This 52-page catalog gives detail information regarding design, strength, material and construction of the many types of chain and attachments. The information included is of value to all users and prospective users of this type of chain.



Passed By The Screens



The Jeffrey Manufacturing Co., Columbus, Ohio, manufacturers of coal mining machinery, electric locomotives, elevating, conveying and crushing machinery, has ready for circulation a very complete and well illustrated 36-page catalog (No. 259) presenting the type "E" swing hammer shredder for reducing wood chips and other fibrous material. Particular attention is called to the simplicity of design in the Type "E" shredder, the provision made for capacity, for durability and accessibility of working parts, and its easy adaptability to the handling of a variety of materials under different conditions of installation and operation. It is equipped with the highest grade, radial ball bearings, which eliminate all bearing troubles and insure maximum service. The new catalog illustrates numerous installations and also contains valuable engineering information, plant layouts and other data of service to plant managers and superintendents.

Personals

Horace D. Kerr, engineer in charge, western technical and western service departments, Atlas Portland Cement Co., New York, has resigned to join the staff of the Nichols-Moore Co., general advertising agents, Cleveland.

H. C. Shields, who was recently appointed general superintendent of the Wolverine Portland Cement Co., Coldwater, Mich., succeeding J. C. Smallshaw, deceased, advises the following appointments of operating staff: W. F. Murray, mechanical engineer; L. A. Hutchins, chemical engineer; J. J. Parker, superintendent, Coldwater plant; J. S. Lockwood, assistant superintendent, Coldwater plant; L. C. Nodel, chemist, Coldwater plant; R. B. Koons, superintendent, Quincy plant; John Dieterman, assistant superintendent, Quincy plant; M. H. McGaffigan, chemist, Quincy plant, and P. H. Sweeney, assistant purchasing agent.

OBITUARY

Wm. H. Essery, 162 Dunn Avenue, Toronto, formerly president of the Crushed Stone, Ltd., died on April 3. Last October Mr. and Mrs. Essery celebrated their golden wedding.

Louis T. Kavanaugh, aged 55, president of the Kavanaugh Sand Co., for years manager of the Mississippi Warrior River Service of the Government barge line, was drowned in the Mississippi River at Memphis. The accident occurred at the foot of Georgia Avenue when a skiff in which he was riding capsized. With him were two negroes, one of whom was drowned. For 30 years Mr. Kavanaugh was active in business and social life at Memphis; last year he moved to St. Louis, where his headquarters were located in the river service.

Quarries

The A. and C. Stone and Lime Co., general offices at 225 North Pennsylvania Street, Indianapolis, Ind., announces that this company will hereafter be known as the Mid-West Crushed Stone Quarries Co. The Mid-West Crushed Stone Quarries Co. operates quarries at Ridgeville and Greencastle, Ind.

The Limestone Products Co. is a new organization launched by several Memphis people—J. E. Hollingsworth, J. F. Halloran of J. E. Hollingsworth & Co. and Halloran-Murphy & McLean, L. J. Moss of John A. Denie Sons Co.; S. W. Portlock, all of Memphis, and John T. Woodruff of Springfield, Mo. The company has acquired limestone holdings on the west bank of Black River at Black Rock, Ark., where crushing plant and lime kilns are being installed. The primary object of the company is to furnish crushed stone for highway work in Eastern Arkansas, West Tennessee and North Mississippi. Many of these highway contracts have already been awarded. The daily output of the company will be 1,600 tons. The deposit runs a high percentage of carbonate of lime and magnesia. The fertilizer and pulverized stone is also contemplated. Williams' patent crusher, Primm crude oil engines are being used along the Frisco Railroad in initial work. John T. Woodruff is president and J. E. Hollingsworth, vice president and manager.

The Linwood Quarries Co., Linwood, Iowa, announces that there is a very heavy demand for crushed stone from all parts of Iowa. The company's new electrically operated plant for crushing stone has been in operation about one week and is proving a great success. The output per day is about 20 carloads with double that amount expected within a few weeks. Barges are also being filled with crushed stone and brought to Davenport and Rock Island for use in those cities.

Preston Crushed Rock Co., Preston, Minn., has received most of the machinery to be installed in the mill and expects to be ready for active operations in May. Considerable excavating will have to be done and a side track put in. The outfit is entirely modern. The crusher will have a capacity of 45 tons per hour. Other equipment consists of a compressor with necessary air drills and a 25-horsepower electric motor, which will be attached to an extension of the Power Company's lines.

The Rainbow Mining and Mineral Products Co., Elsinore, Calif., will build a new mill at a cost of \$50,000, according to W. J. Sergel, secretary of the Elsinore Chamber of Commerce. It will be electrically run with power supplied by the Southern Sierras Power Co. The Rainbow company, whose principal product is slate, has mines at Elsinore, in New York State and Vermont. It is also announced that control of the company has recently been purchased by M. N. Stern, a Los Angeles mining man.

The W. G. Wright Co., Minneapolis, Minn., which does a large crushed stone business, sent A. J. Parent to Garretson, S. D., to secure a renewal of the option which this company held on a strip of land comprising 100 acres, which takes in most of the Palisades. He announced that while his company had been interfered with somewhat in connection with their original plans through not securing concessions from railroad company, they expected to go to work establishing the Garretson crusher in a very short time. There has been some opposition to the enterprise raised at and around Garretson on account of the destruction of a greater part of the beauty of the Palisades, which will follow if the Minneapolis company goes ahead with their contemplated project.

The Becker Limestone Co., Chili Station, N. Y., is reported to have been reorganized and that a new company with a capital of \$50,000 will take over the old plant and operate it. The following board of directors will have charge of the affairs of the company: Fred H. Becker, of the Becker Limestone Co.; Matthew P. and John H. Odenebach and Fred J. Waddell, of Rochester. The new organization will be known as Dolomite Products Co., and plans are being made to carry on a general rock-crushing and quarrying business. The land on which the plant is located, a short distance east of Coldwater, is an old lime kiln. The property was taken possession of by the Becker Limestone Co. about three years ago and production began in 1918. The old quarry had not been worked for nearly a quarter of a century, and the stone lime kiln had gradually fallen into decay. The products manufactured by the Becker company consisted mostly of agricultural lime and dolomitic limestone, used principally as a flux in steel mills, open-hearth furnaces and glass-manufacturing plants.

Phosphate

The American Agricultural Co., Jacksonville, Fla., suffered a \$10,000,000 fire loss.

Construction is progressing at Fernandina, Fla., upon the \$500,000 phosphate terminal plant of the Florida Terminal Co., previously organized. Jack Camp is president, with main office at Ocala. The plant buildings will be of steel sheathed with corrugated galvanized iron, being on pilings, with foundations and tunnels of concrete. The crushing and drying plant will have hourly capacity of 60 tons, while the shiploding equipment will have an hourly capacity of 500 tons and the storage capacity is to be 25,000 tons. Charles E. Waddell of Asheville, N. C., is the consulting engineer, furnishing the plans and specifications, and with him is associated D. J. Dreyer, also of Asheville.

The Read Phosphate Co., Charleston, S. C., has started to build a fireproof building in the place of the one recently lost by fire.

The Santa Cruz Portland Cement Co., main offices in the Crocker Building, San Francisco, Calif., and whose works is at Davenport, Calif., voted an increase on the dividend rate of from 5 per cent to 6 per cent on company stock at its annual meeting. The company's excellent financial condition, which made the increase in dividend possible, is attributable to the executive ability of George T. Cameron, president of the concern, who during his term of office has placed the company on a firm financial basis. W. W. Crocker was made a director and vice-president, and W. R. Berry, secretary and treasurer.

Cement

The West Side Sand and Gravel Co., Salem, Ore., reports that it is making a \$30,000 addition to its plant.

The Syracuse Cement Factory, Warsaw, Ind., has resumed operations. The plant, which for many years manufactured cement out of marl taken from Lake Wawasee, has been altered so that limestone will be used. The change in the process followed a long fight by Wawasee cottage owners against taking marl from the lake. The company is now drilling in the hope of finding a deposit of limestone at Syracuse.

The Portland Cement Association, Chicago, announces the following changes concerning several of its district engineers: C. N. Reitz, district engineer, Seattle office, appointed district manager, Pacific Coast offices at Seattle, Portland, San Francisco and Los Angeles; A. P. Denton, district engineer, Dallas office, assumes charge of San Francisco office as district engineer; Charles A. Clark appointed district engineer, Dallas office, to succeed Mr. Denton; H. E. Frech assumes charge of St. Louis office as district engineer.

Sand and Gravel

The Nebraska & Iowa Sand and Gravel Co., whose headquarters are in Nebraska City, Neb., and who have large holdings across the river will begin active operations some time during April. They are now receiving orders, and will ship out carloads the latter part of this week. According to the rating given them by the Burlington they will be able to sell sand cheaper than any other company in this vicinity. In Iowa their rate is 60 cents per ton to Shenandoah, while from Louisville it is \$1. They have 40 towns in Iowa they can supply.

P. V. Ewing reports that there is a large and valuable undeveloped gravel deposit on the farm of R. C. Mitchell, near Carlisle, Ohio. This property consists of 63 acres of good gravel; over 35 acres of which there is but a 3-ft. layer of overburden. The property has been investigated by sinking wells and the gravel proves to be a very clean material which runs from 12-in. on down. It is estimated that it will run nearly 70 per cent gravel. The deposit is 66 ft. deep and is right at the junction of B. and O. and C. C. C. and St. L. railroads, so that it has a natural facing of 2000 ft. along the B. and O. tracks. The deposit is thus connected directly to both Cincinnati and Dayton by two lines. The haul to Cincinnati is 41 mi. and to Dayton 14 mi. Several years ago, just after the last big flood, the B. and O. Railroad opened a pit just across the tracks from the Mitchell property and used the material to fill washouts. It seems that the material proved quite satisfactory, but that the pit was abandoned because of property limits restriction. If the Mitchell property were to be developed it is cited that this pit would be a convenient place to obtain a water supply and if necessary to dispose of overburden. R. C. Mitchell is desirous of interesting an established producer in developing this property.

CLASSIFIED ADVERTISING

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Exceptional Stone Plant FOR SALE

Gates plant of 1200 tons rated capacity, fully equipped; has No. 7½ and No. 5 Gates crushers, screens, elevators and general equipment, operated by electric power. Located at edge of city of 240,000 population. Railroad alongside, switch in, bins, etc. A modern plant in every way. Offered with 150 acres of land which can be sold off in a few years in lots at several times present cost. Also have 10 acres that will make a fine Building Stone Quarry. Unlimited demand for output. No labor troubles. Will sell this property outright or lease on royalty to responsible parties.

Correspondence Invited

CHAS. H. BARTOW
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Help Wanted

WANTED

Young man for assistant superintendent who has exceptional mechanical ability, familiar with the Raymond pulverizing system, capable of handling men with best results, able to give uniform capacity of plant by eliminating breakdowns to the minimum. Knowledge of operation that is essential for economical production, and upkeep of machinery. Submit references.

Address Box 1397, Care of Rock Products

WANTED GENERAL SUPERINTENDENT

For large quarry operation. Must be familiar with handling steam shovels, locomotives, large crushers, etc. State past experience, age and salary expected. Give references. Knowledge of heavy blasting and upkeep of all machinery to insure efficient and economical operation necessary. Must have Pep. Address

Box 1400 Care of Rock Products

Help Wanted

WANTED

Experienced trap rock crushing plant operator. Plant consisting of 60" x 84" jaw crusher, nine gyratory crushers, electrically driven. Must have thorough knowledge of economical production for continuous operation. State age, experience, reference and salary wanted.

Box 1399 Care of Rock Products

Situation Wanted

SITUATION WANTED

Superintendent desires engagement where thorough knowledge of operation is essential for economical production; thorough knowledge of heavy blasting and efficient upkeep of machinery. References. Address

Box 1351 Care of Rock Products

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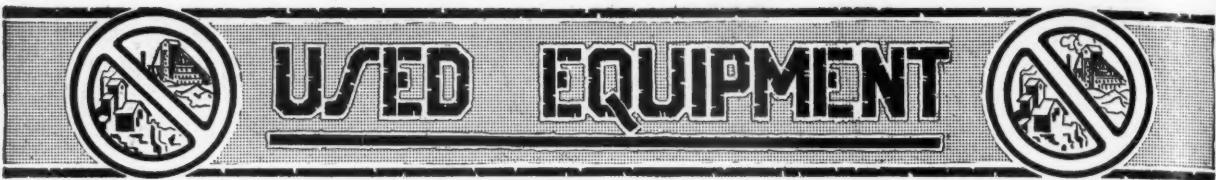
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Rates for advertising in the Used Equipment Department: \$2.50 per column inch per insertion. Minimum charge, \$2.50. Please send check with your order. These ads must be paid in advance of insertion.

FOR SALE—DRAG-LINES

Drag-Line, Monigan, all steel, 16' circle swing—skid and roller type—60' latticed steel boom—1-yd. Page bucket—steam driven. Outfit used one season. Price on cars, \$7500. Location, North Dakota District. Immediately available.

Drag-Line—Schaneing Drag-Line with wood frame—1-yd. Page bucket—frame new last year—engine and boiler in first class shape. Available May 15th. Location, North Dakota District.

ROTARY DRYER

American Clay Machinery Co. Rotary Direct Heat Dryer—60' long—48" dia. cylinder. Complete. Used two seasons. Available May 15. Location, Minneapolis District.

No. 6 Gates Crusher.
No. 5 Austin Crusher.
4—48" x 16" Revolving Screens.
1—17" x 44" Elevator Complete.

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97 Wisconsin Street

Milwaukee, U. S. A.

FOR SALE

Anderson double bladed diamond saw and stone planer.

2 Komnick rotary presses—for sand-lime brick.

3 Retorts, car and turntables.

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New—RAILS—Relaying

All sections on hand for quick shipment. Reasonable prices quoted. Our stock is very complete.

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Repaired Contractors' Equipment

Steam Shovels

Model 60 Marion Shovels, 2½-yard dippers, Nos. 1999, 1959

1—Model 70 Marion, 2½-yd. dipper, Shop No. 2693.
1—Model O Thew, ½-yard dipper, full revolving, on traction wheels.

Hoisting Engines

1—8½ x 10 DC 2-D Lambert, with boiler
1—6 x 10" DC 2-D Byers.
1—6½ x 10 DC 2-D Mundy, with attached swinger and boiler

Cableway

1—Lidgerwood Cableway, 1164-ft. span, with 9 x 10" DC Reversible Link Motion Cableway Engine, 3-ton capacity

We have a large stock of thoroughly repaired Construction Equipment of all kinds ready for immediate shipment.

Locomotives

1—14 x 20" standard gauge saddle tank Locomotive.

2—American 10 x 16" Locomotives, 36" gauge, with butt joint boilers

4—18-ton 10 x 16" Dinkeys, 36" gauge

Clam Shell Buckets

1—1½-yard Browning.

Cars

20—12-yard Western Air Dump, standard gauge, 26 ft. bed.

H. KLEINHANS COMPANY

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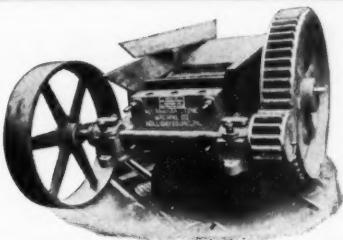
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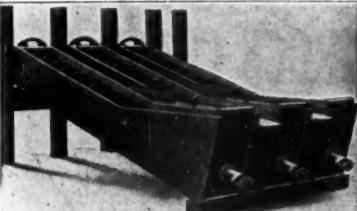
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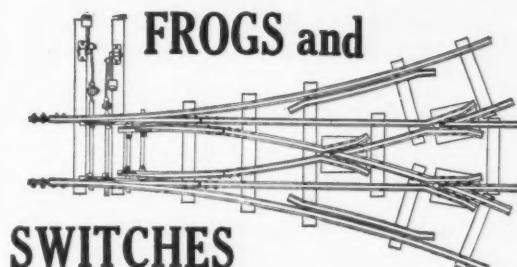
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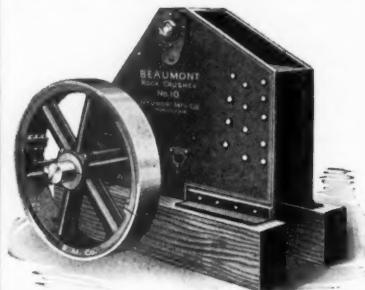
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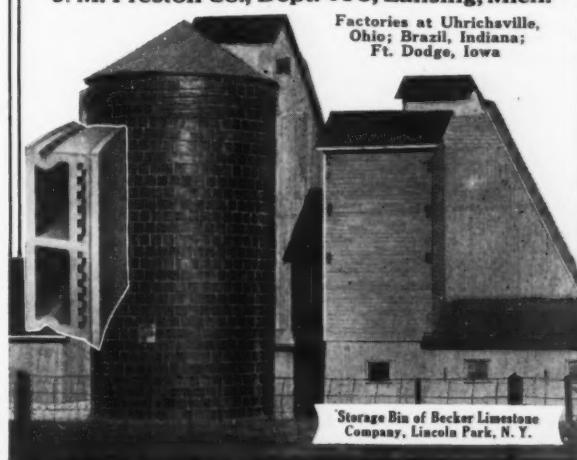
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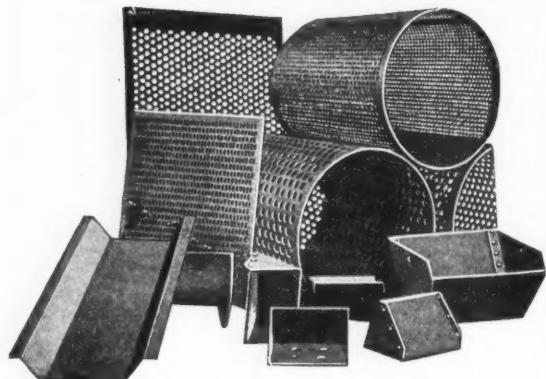
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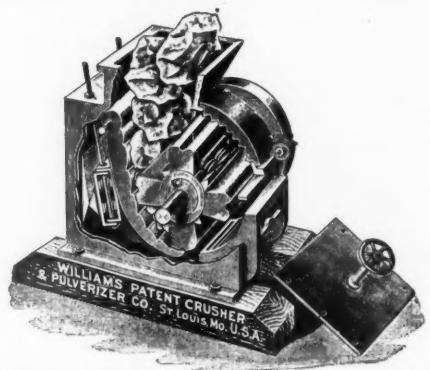
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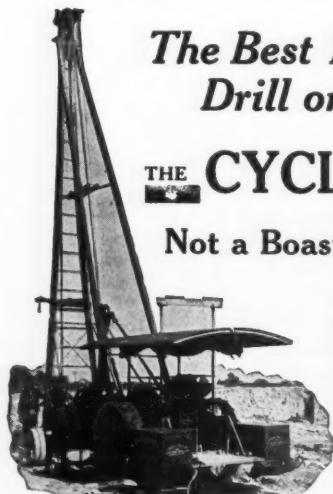
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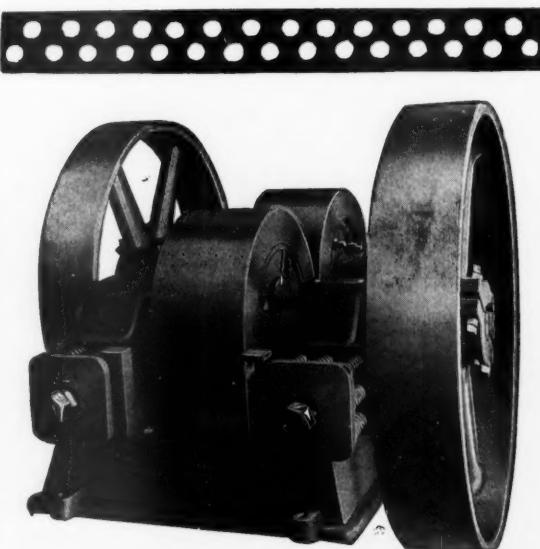
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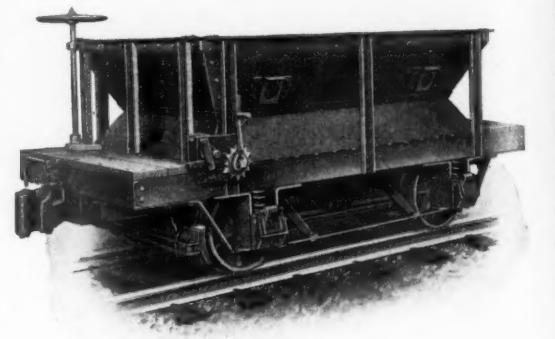
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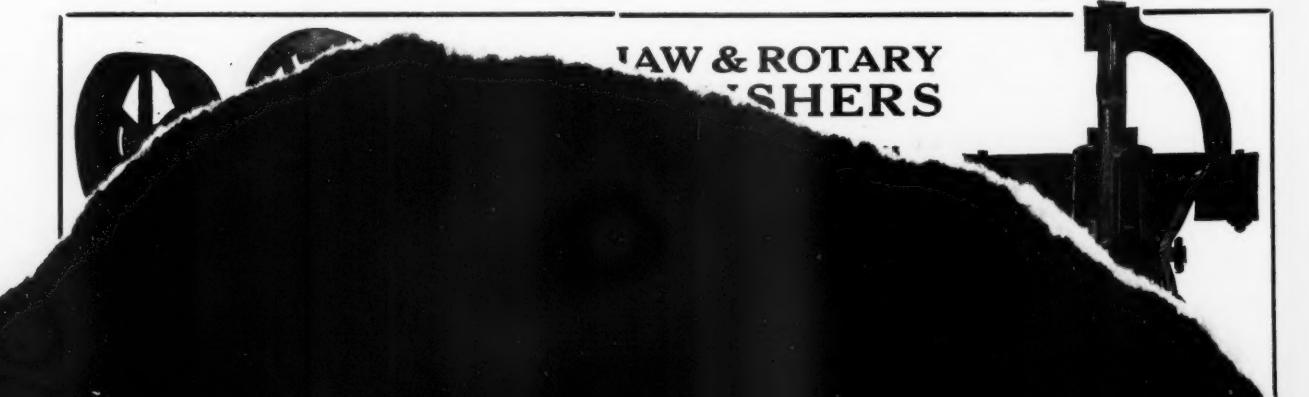
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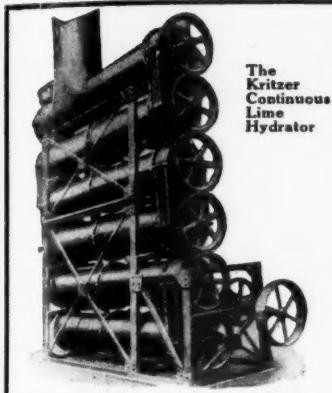
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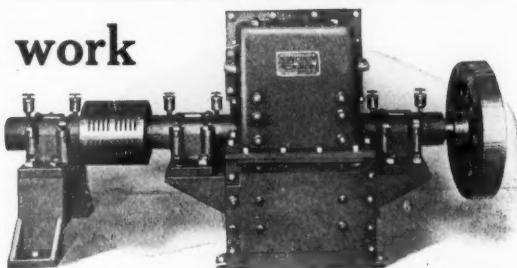
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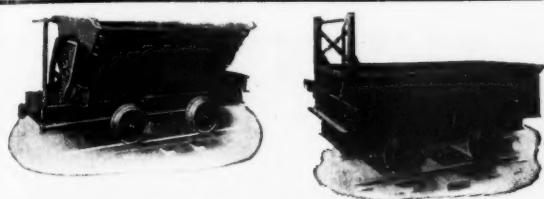
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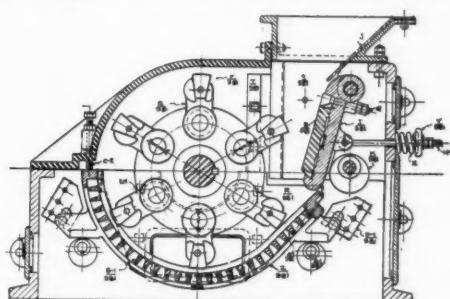
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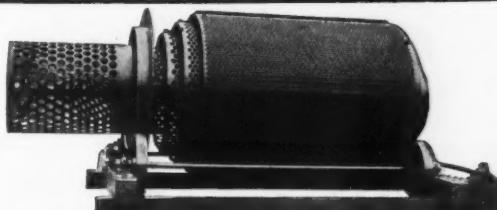
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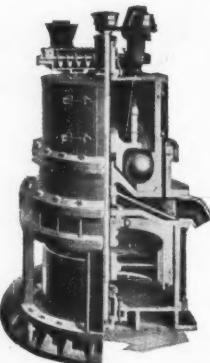
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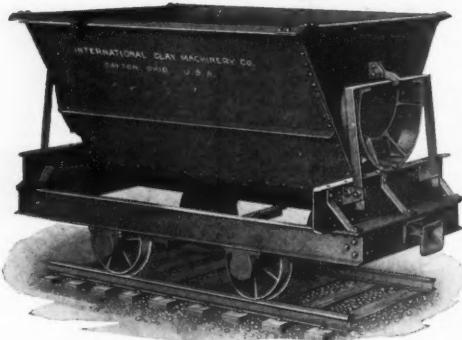
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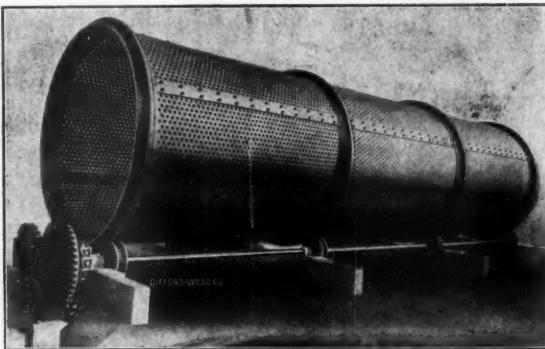


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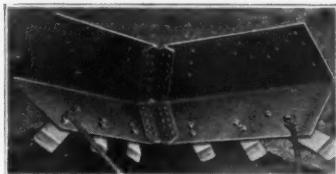
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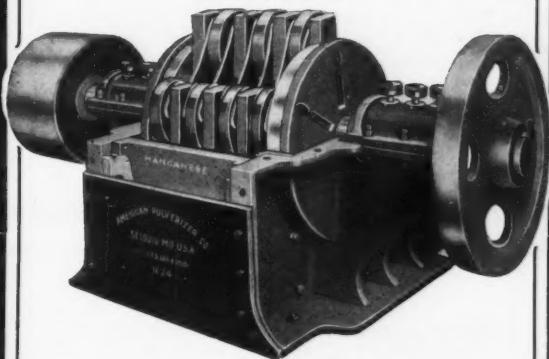
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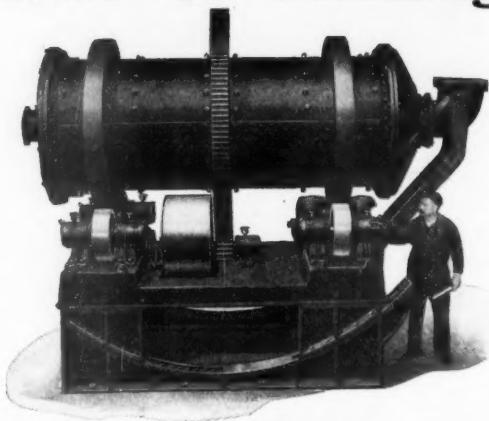
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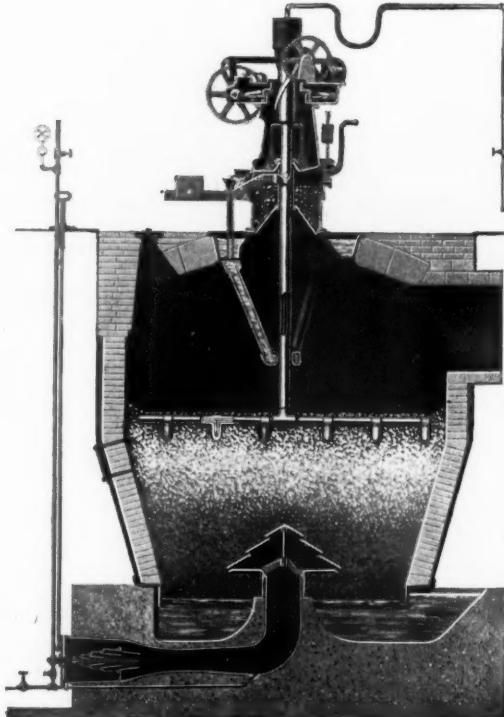
They deliver a constant supply of high quality gas, thus insuring a uniform temperature in the kiln. This uniform supply of high quality gas burns with a long, clear flame which resembles the flame from a wood fire. The result is a greater production of first grade lime.

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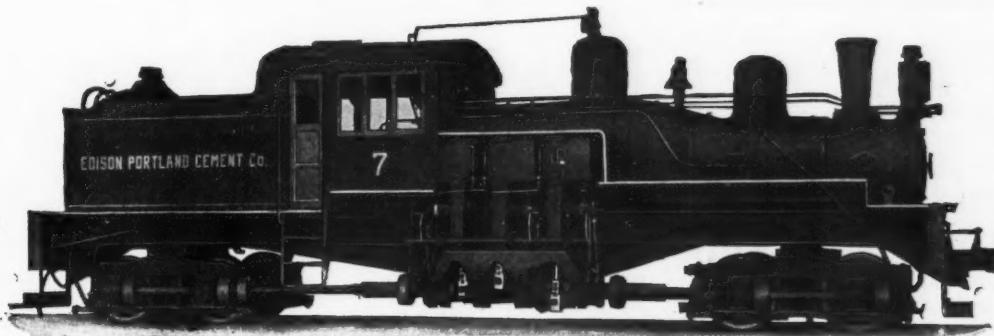
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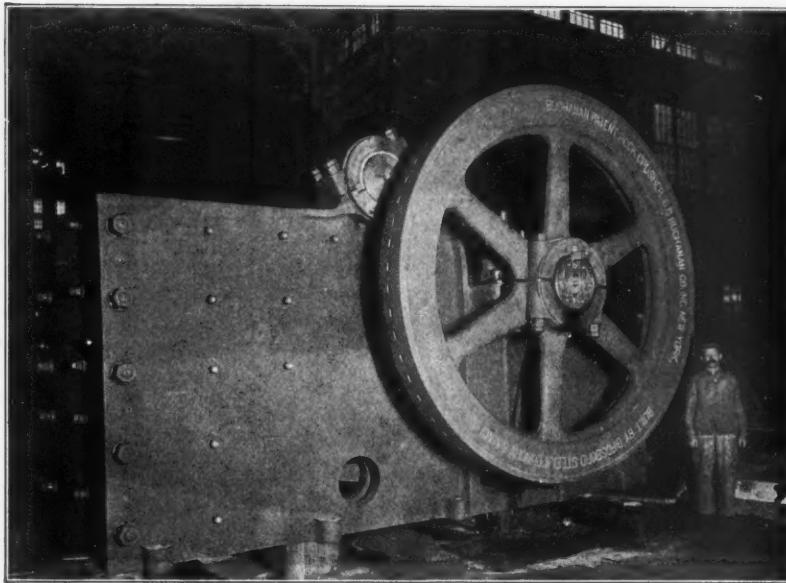
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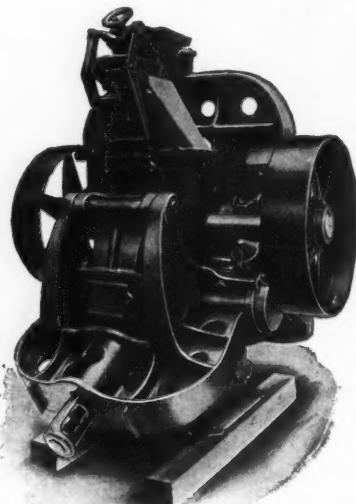
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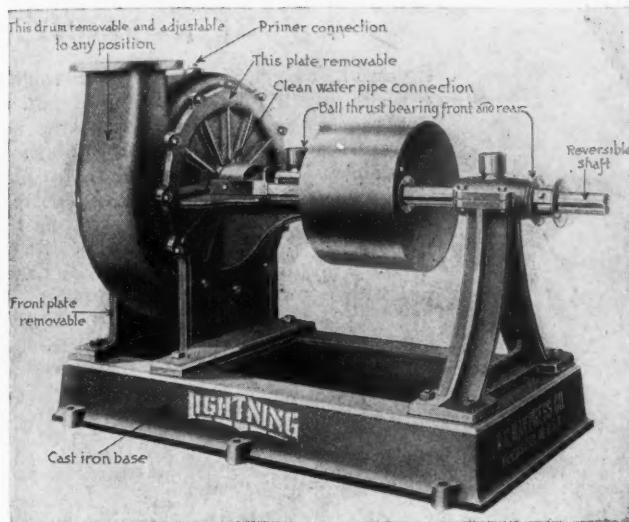
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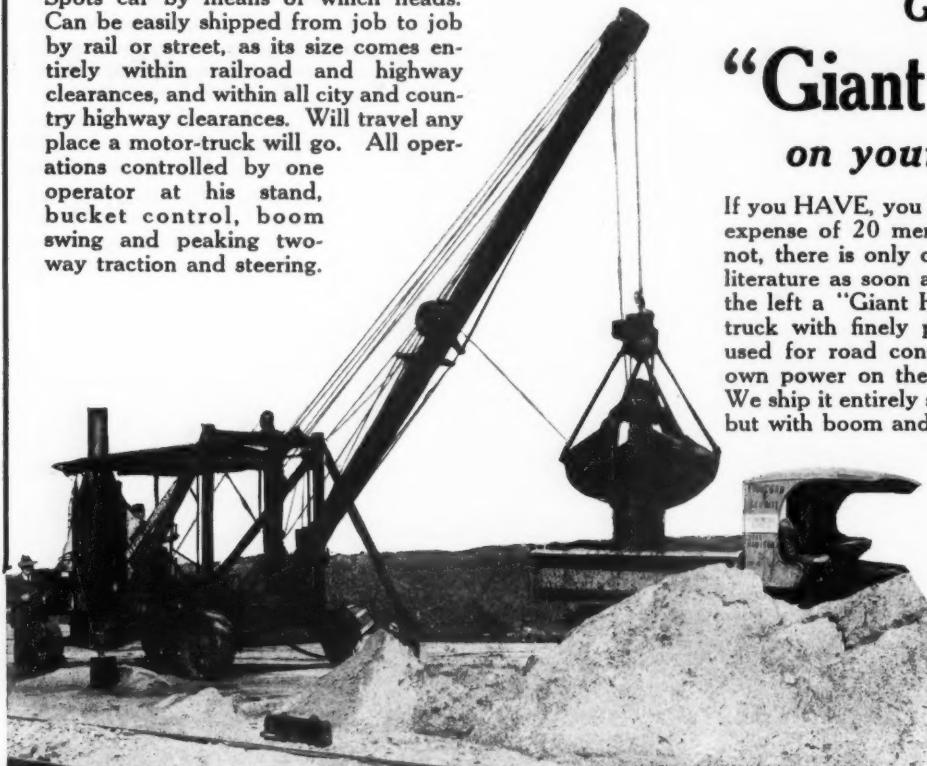
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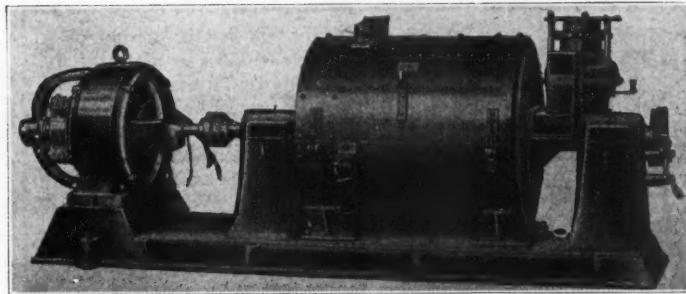
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SCHAFFER Continuous Lime Hydrators

A UTOMATIC operation delivers lime by weight, not volume, to the Schaffer Hydrator. Automatically, water, too, is added in correct proportion—insuring a continuous flow of a superior product.

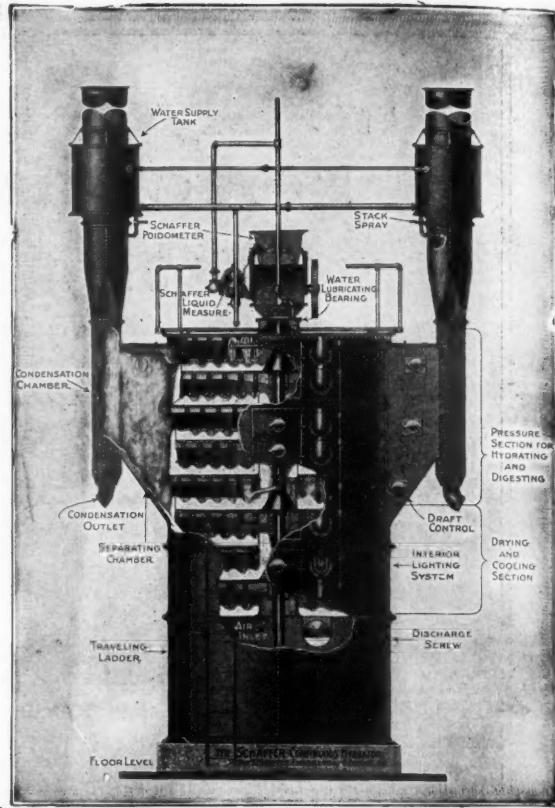
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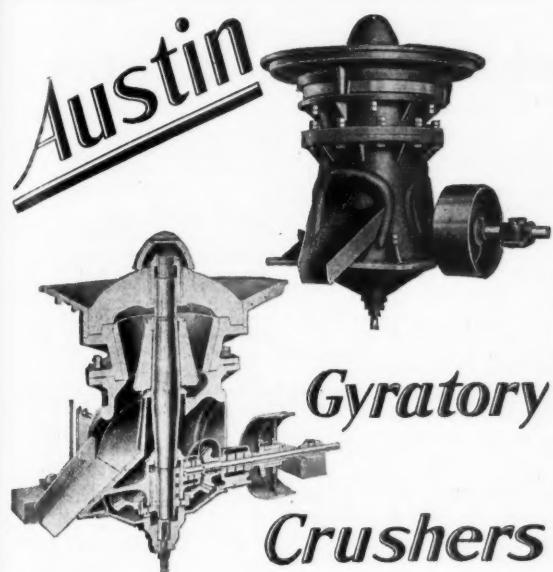
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April 24, 1920

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77



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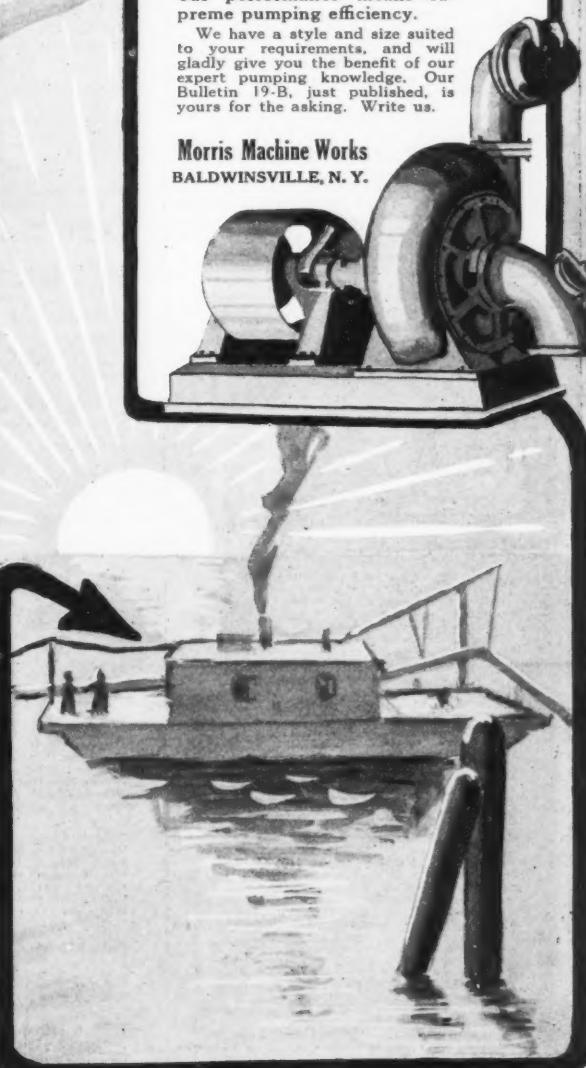
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International Clay Mach. Co., Dayton, O.

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Stephens-Adamson Mfg. Co., Aurora, Ill.

LOCOMOTIVES

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Fair-Root-Heath Co., Plymouth, Ohio.

Jeffrey Mfg. Co., The Columbus, Ohio.

Lima Locomotive Works, New York City.

Loco. Co., H. C., Marion, O.

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S-A Gilbert Screens

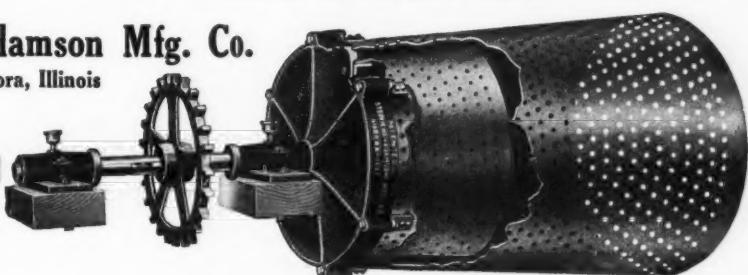
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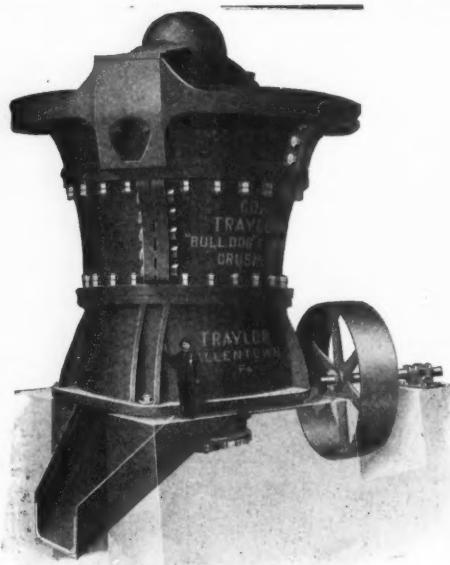
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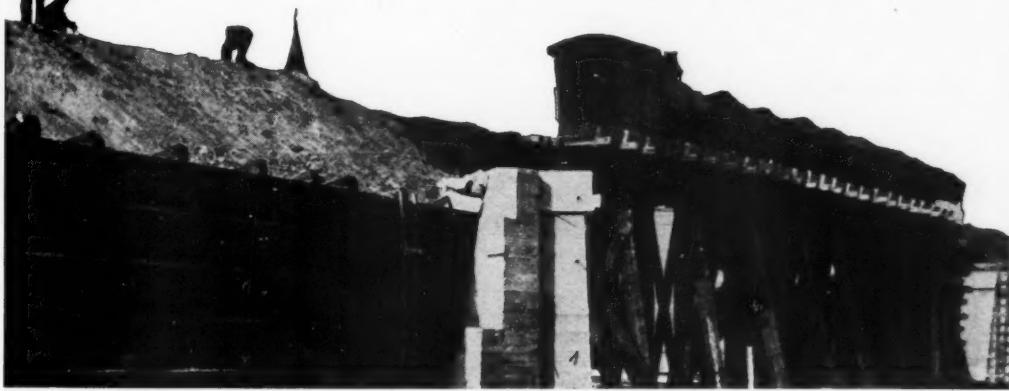


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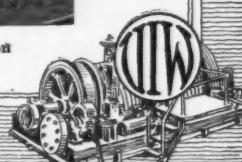
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